Assessment report
Limited Framework Programme Assessment

BSc Civil Engineering

Delft University of Technology

Contents of the report

1. Executive summary

In this executive summary, the panel presents the main considerations, which led to the assessment of the quality of the Bachelor Programme Civil Engineering of Delft University of Technology. The programme was assessed according to the standards of the limited framework, as laid down in the NVAO Assessment framework for the higher education accreditation system of the Netherlands, as published on 20 December 2016 (Staatscourant nr. 69458).

The programme in Civil Engineering aims to provide students with substantive knowledge, allowing them to continue their education in Civil Engineering or related fields on a master's level. Graduates of the programme have learned to apply the obtained knowledge within the three main subfields of Civil Engineering: construction, transport and water. In addition, graduates have acquired communicative skills, learn how to initiate and participate in team projects and have gained understanding in doing research. In accordance with the main vision of the faculty, which is to educate Engineers who build for people and society, the programme's learning outcomes include the awareness of contextual factors such as sustainability, ethics and aesthetics. The panel is positive about this and within the same drive reckons the extent to which the learning outcomes address the appreciation of uncertainty and limitations of knowledge as a sign of a programme which is highly aware of its academic and societal context. The learning outcomes of the programme reflect a bachelor's level and have a clear academic orientation. The panel recommends the programme to consider drafting the learning outcomes in a more specific way, since these rather generally describe disciplinary knowledge obtained by students. The panel assesses standard 1, the intended learning outcomes, as satisfactory.

The programme's learning and teaching environment is carefully designed and consists of a coherent, compact set of courses, structured in several learning lines. The panel noticed that the programme is balancing its ambitions in terms of the level of the programme and the feasibility of the programme. On the one hand, the panel appreciates the level of ambition of the programme. On the other hand however, the panel has established that the programme tends to be overloaded, resulting in study delay and a low study success rate. The programme is very much aware of this tension and takes measures to support students who struggle with specific courses. However, the panel recommends the programme to consider measures that improve the extent to which students complete their studies within due time. In addition, study guidance and a mentoring programme are available to accommodate students and inform them about the study mode expected of them. The programme is very well organized and is delivered by a dedicated team of high-quality staff members. The learning activities are well-thought and allow students, in combination with the offered content, to obtain the intended learning outcomes. The panel assesses standard 2, the teaching and learning environment, as good.

The panel has established that the assessment system in place functions as it should. The programme incorporates both summative and formative assessment and the assessment methods chosen are supportive to the study goals of each course. The panel suggests the programme to draft an assessment plan for the programme as a whole, in order to enhance the coordination of assessment throughout the programme. The programme management has taken measures to ensure validity, reliability and transparency with regard to the assessment of students. The panel took notice of the assessment of the thesis which is adequate but could be improved. The panel suggests the programme management to enhance a common use of the assessment form, in order to document well why a certain grade was given. The Board of Examiners performs its duties as it should, however, measures taken in order to pro-actively safeguard the quality of assessment of courses and theses were taken rather late. In addition, the panel strongly recommends the programme management to effectively amplify measures taken and suggested by this Board in order to strengthen the quality of the programme. The panel assesses standard 3, assessment, as satisfactory.

The programme's graduates have substantive knowledge in the area of Civil Engineering and are able to apply this knowledge in an effective manner. This is demonstrated in the theses reviewed by the panel. Students have developed their critical thinking and have been trained in academic reasoning. The panel recommends the programme to strengthen the extent to which this is reflected in the thesis since not all these contain a (more elaborate) reflection on the choice of methodology, which the panel deems an essential element of academic training. The panel has established that graduates of the programme are able to continue their studies successfully at a master's level and assesses standard 4, achieved learning outcomes, as satisfactory.

The panel that conducted the assessment of the Bachelor Programme Civil Engineering of Delft University of Technology assesses this programme to meet the standards of the limited framework, as laid down in the NVAO Assessment framework for the higher education accreditation system of the Netherlands, judging the programme to be satisfactory. Therefore, the panel recommends NVAO to accredit this programme.

Rotterdam, 11 April 2019

Prof. dr. P. Bosch
(panel chair)

Jetse Siebenga MSc.
(panel secretary)

2. Assessment process

The evaluation agency Certiked VBI received the request by Delft University of Technology to support the limited framework programme assessment process for the Bachelor Civil Engineering of this University. The objective of the programme assessment process was to assess whether the programme would conform to the standards of the limited framework, as laid down in the NVAO Assessment framework for the higher education accreditation system of the Netherlands, published on 20 December 2016 (Staatscourant nr. 69458).

The management of the programmes in the assessment cluster Civil Engineering convened to discuss the composition of the assessment panel and to draft the list of candidates.

Having conferred with management of the programme, Certiked invited candidate panel members to sit on the assessment panel. The panel members agreed to do so. The panel composition was as follows:

- Prof. dr. Petra Bosch, Professor of Management, Technology and Innovation, Chalmers University of Technology (Chair);
- Prof. dr. Jos Arts, Professor of Environmental and Infrastructure Planning, University of Groningen;
- Ir. Adriënne van der Sar, Deputy Staff Director of the Delta Programme Commissioner;
- Quinten Swanborn BSc, student Master Industrial Engineering & Management, University of Groningen.

On behalf of Certiked, J.W. Siebenga MSc. served as the secretary in the assessment process. The overall coordination of the assessment cluster Civil Engineering was executed by drs. W. Vercouteren.

All panel members and the secretary confirmed in writing being impartial with regard to the programme to be assessed and observing the rules of confidentiality. Having obtained the authorisation by the University, Certiked requested the approval of NVAO of the proposed panel to conduct the assessment. NVAO have given their approval.

To prepare the assessment process, the process coordinator convened with management of the programme to discuss the outline of the self-assessment report, the subjects to be addressed in this report and the site visit schedule. In addition, the planning of the activities in preparation of the site visit were discussed. In the course of the process preparing for the site visit, programme management and the Certiked process coordinator regularly had contact to fine-tune the process. The activities prior to the site visit have been performed as planned. Programme management approved of the site visit schedule.

Well in advance of the site visit date, programme management sent the list of final projects of graduates of the programme of the last two complete years. Acting on behalf of the assessment panel, the process coordinator selected 15 final projects from this list. The grade distribution in the selection was ensured to conform to the grade distribution in the list, sent by programme management.

The panel chair and the panel members were sent the self-assessment report of the programme, including appendices. In the self-assessment report, the student chapter was included. In addition, the expert panel members were forwarded a number of final projects of the programme graduates, these final projects being part of the selection made by the process coordinator.

A number of weeks before the site visit date, the assessment panel chair and the process coordinator met to discuss the self-assessment report provided by programme management, the procedures regarding the assessment process and the site visit schedule. In this meeting, the profile of panel chairs of NVAO was discussed as well. The panel chair was informed about the competencies, listed in the

profile. Documents pertaining to a number of these competencies were presented to the panel chair. The meeting between the panel chair and the process coordinator served as the briefing for panel chairs, as meant in the NVAO profile of panel chairs.

Prior to the date of the site visit, all panel members sent in their preliminary findings, based on the self-assessment report and the final projects studied, and a number of questions to be put to the programme representatives on the day of the site visit. The panel secretary summarised this information, compiling a list of questions, which served as a starting point for the discussions with the programme representatives during the site visit.

Shortly before the site visit date, the complete panel met to go over the preliminary findings concerning the quality of the programme. During this preliminary meeting, the preliminary findings of the panel members, including those about the final projects were discussed. The procedures to be adopted during the site visit, including the questions to be put to the programme representatives on the basis of the list compiled, were discussed as well.

On 3 December 2018, the panel conducted the site visit on the Delft University of Technology campus. The site visit schedule was in accordance with the schedule as planned. In a number of separate sessions, the panel was given the opportunity to meet with Faculty Board representatives, programme management, Examination Board representatives, lecturers and final projects examiners, professional field and students and alumni.

In a closed session at the end of the site visit, the panel considered every one of the findings, weighed the considerations and arrived at conclusions with regard to the quality of the programme. At the end of the site visit, the panel chair presented a broad outline of the considerations and conclusions to programme representatives.

Clearly separated from the process of the programme assessment, the assessment panel members and programme representatives met to conduct the development dialogue, with the objective to discuss future developments of the programme.

The assessment draft report was finalised by the secretary, having taken into account the findings and considerations of the panel. The draft report was sent to the panel members, who studied it and made a number of changes. Thereupon, the secretary edited the final report. This report was presented to programme management to be corrected for factual inaccuracies. Programme management were given three weeks to respond. Having been corrected for these factual inaccuracies, the Certiked bureau sent the report to the University Board to accompany their request for re-accreditation of this programme.

3. Programme administrative information

Name programme in CROHO:	B Civiele Techniek
Orientation, level programme:	Academic Bachelor
Grade:	BSc
Number of credits:	180 EC
Specialisations:	n.a.
Location:	Delft
Mode of study:	Full-time (language of instruction: Dutch)
Registration in CROHO:	21PF-56952
Name of institution:	Delft University of Technology
Status of institution:	Government-funded University
Institution's quality assurance:	Approved (valid until 20/11/2023)

4. Findings, considerations and assessments per standard

4.1 Standard 1: Intended learning outcomes

The intended learning outcomes tie in with the level and orientation of the programme; they are geared to the expectations of the professional field, the discipline, and international requirements.

Findings
The Bachelor programme in Civil Engineering of the University of Delft is a three-year (180 EC) programme in the domain of Civil Engineering. The University of Delft offers, in addition, several Master programmes in this domain.

The panel established that the programme aims to educate future engineers who are able to participate and show leadership in the design, realisation, operation and maintenance of large-scale projects in civil engineering. The programme entails a multi-disciplinary approach. Students are therefore equipped with knowledge and understanding of the broad field of Civil Engineering which covers primarily engineering fundamentals such as mathematics, mechanics and materials. The programme distinguishes three main fields of application of these fundamentals, which are construction, water and transport. The programme's graduates have substantive understanding of research in these areas, which are complex and in which developments can be hard to predict. Graduates of the programme are able to apply their knowledge into practice and make a design, develop solutions, provide multi-criteria analysis or different alternatives to certain problem. Another important aspect of the programme is that graduates not only possess intellectual skills but also have developed an attitude and the know-how to initiate and implement multi-disciplinary team projects.

The programme's ambitions have been translated in intended learning outcomes which have originally been drafted according to the so-called Meijers' Criteria. The Meijers Criteria were developed for engineering education in the Netherlands. In addition to these intended learning outcomes, the programme drafted its learning outcomes in terms of the Dublin Descriptors in the self-evaluation. The panel established that the programme chose for a broad description of the attained knowledge and levels in the learning outcomes in order to remain flexible in the programme and address the breadth of the professional field.

The programme made an international comparison of the intended learning outcomes with several programmes in Europe and Singapore. It shows that the final attainments as drafted by Delft are comparable to those of other programmes. Unique is the learning outcome that states that graduates appreciate uncertainty, ambiguity and limitations of knowledge. The programme also included awareness of ethical, social, environmental, aesthetic and economic consequences as an intended learning outcome. The programme has an emphasis on the learning outcomes that address the ability to initiate team projects in a multidisciplinary setting as well as the ability to develop a model.

The programme aims its graduates to build for people and society. During the site visit, the panel took notice of the Faculty-wide policies in which the programme resides. The Faculty focusses on three aspects: societal themes, climate (change), and people & health. In order to keep up with developments in the professional field of Civil Engineering, the programme has ample connections to governmental and business organisations within the various subfields of Civil Engineering. The research Environment within Delft University as well as the ample connections to business and governmental organisations allow the programme to stay up to speed with relevant developments. The programme is actively following up developments on Environmental Engineering.

The learning outcomes of the Dutch Civil Engineering programmes are regularly reflected upon by an advisory council representing industry and government, the Dutch OCIB (Stichting Universitair Onderwijs Civiele Techniek voor Bedrijfsleven en Overheid). Representatives of the professional field

expressed their appreciation for the programme's learning outcomes and the ambitioned level of the programme during the site visit. They mentioned especially the element of teamwork which is addressed in the learning outcomes and practised during the programme as important to maintain. In addition, they are positive on the attention of the programme for digitalization.

Considerations
The panel is positive about the learning outcomes of the programme. These reflect a bachelor's level and are well-formulated. They provide insight to what can be expected of graduates of the programme, and display a high level of ambition of the programme. Graduates of the programme have the right entry qualifications for a master programme in Civil Engineering and in related fields. The panel has observed that in order to be able to prepare BSc. students for a programme on MSc. Level in Environmental Engineering, the panel deems that a stronger focus on chemistry is necessary in the BSc. programme.

Although the panel agrees with the programme that rather general learning outcomes allow the programme flexibility, the extent, to which the learning outcomes can be used as an instrument to steer the programme and safeguard its quality, is limited. In addition, the vast majority of the fundamentals of Engineering aren't subject to many changes and don't need such flexibility. The panel recommends the programme therefore to reconsider the balance between flexibility in the learning outcomes and a precise indication of what students comprehend at the end of their studies.

The programme and faculty are well aware of relevant developments within the world of Civil Engineering and related fields. The panel is very positive about this. From the benchmark and from the discussions during the site visit, the panel also found that the programme is well aware of the (level of) content and methods used in Civil Engineering programmes across the globe. The committee appreciates the focus of the programme on society and finds it positive that the learning outcomes contain an explicit recognition of the fact that nowadays uncertainty is an important element in Civil Engineering and Construction Engineering. Due to the increasing emphasis on the resilience of people and due to climate change, Civil Engineers will be confronted more often with the possibility of a shortened life-cycle of Engineering solutions. The programme has rightly addressed this notion in the intended learning outcomes.

Assessment of this standard
These considerations have led the assessment panel to assess standard 1, Intended learning outcomes, to be satisfactory.

4.2 Standard 2: Teaching-learning environment

The curriculum, the teaching-learning environment and the quality of the teaching staff enable the incoming students to achieve the intended learning outcomes.

Findings
The programme resides in the department of Civil Engineering and Geosciences. The Director of Studies is responsible for the day-to-day management of the programme and the MSc. Programmes in Civil Engineering. The Board of Studies, being composed of lecturers and students, advises the programme management on the quality of the programme, the Teaching and Examination Regulations as well as the implementation of the Teaching and Examination Regulations. The Board of Examiners has the authority to ensure the quality of the examinations and assessments of this programme The Board of Examiners has the authority to ensure the quality of the examinations and assessments of this programme and the programme of Applied Earth Sciences.

The entrance criteria for the programme are published on the university's website. Students who have a Dutch VWO diploma with the profiles Nature and Technique (N&T) or Nature and Health (N&G) including mathematics B are admissible to the programme. In addition, students with a suitable propedeutic diploma from a university of applied sciences are admissible. Students who apply for admission have to fill in a questionnaire ('studiekeuzecheck'). In cases where there seems to be a mismatch, students are contacted by a study counsellor. The number of students entering the programme dropped over past three years from 475 in 2014-2015 to 369 in 2016-2017, the average is 424 students per year. The panel discussed with the programme whether it considered offering the programme in English (as suggested by representatives of the professional field) therewith opening the programme to students from abroad. In expectance of an unmanageable increase in student numbers, the programme decided not to change the official language of the programme in the near future. For now, Dutch will remain the official language.

The 180 EC programme is built up in six semesters, divided over a period of three years. The fifth semester contains a 30 EC minor space during which students can freely choose from a range of 30 EC minor programmes in a wide range of topics. All minor programmes include a substantial minor project in which students of different disciplines have to collaborate. Students can also decide to study abroad, around 30% of the students does so.

The latest revision (2013) of the curriculum contained a stronger focus on the fundamentals of Civil Engineering, combined with a better structuring through learning lines and focus on the didactical models in use, as well as the integration of an ethics learning line. The content of the programme is related to the learning outcomes and for each course, specific learning goals are formulated, specifying the learning outcomes.

The first- and second year courses are categorized as either a mathematics course, fundamentals course, application course or a building site course. This distinction form learning lines throughout the curriculum. Courses in the mathematics learning line are based on a TU-Delft campus-wide programme in mathematics. Acquired knowledge in mathematics is directly applied in courses within the fundamentals learning line, such as Structural Mechanics, Dynamics and Fluid and Soil Mechanics. The courses in the fundamentals learning line all focus strongly on the mathematical modelling of the physical processes involved and have a theoretical focus.

The courses in the applied learning line address topics such as design, construction materials and environment, transport and planning, urban water and environment-techniques and hydrology. These courses contain domain specific knowledge and skills in civil engineering at BSc. level.

Courses in the Building Site learning line strongly focus on engineering skills and professional attitude. Students learn basic drawing skills and especially learn how to work with Building Informatics Packages and programming and scripting with Python. The programme introduced an ethics learning line as of 2018-2019. It runs throughout the programme and teaches students important principles in ethics.

The panel discussed with the programme management the elements that focus on the academic training of students. From the first day of the programme, students are taught basic principles of complex problem solving. Students learn a systematic approach, focus on the total system and clear presentation in writing. Throughout the programme students work on acquiring design methodology, research skills often through problem-oriented learning, working on project teams as well as individual learning. Half of the courses in the applied learning line involve project work and the courses in the building site learning line are all project work. The programme offers a variety of learning activities. Per course, students receive a course syllabus, which contains formative and summative assessments.

In addition, students are trained in academic reasoning throughout the programme, culminating in the BSc. Thesis for which students develop a research from scratch and which has to include reflections on academic research and design processes. The thesis is written in a 10-week period in the sixth period. Students meet at least three times officially with their supervisor, during which the progress and intermediate results are discussed.

In addition to the thesis, students choose two elective modules in the sixth module, from a variety of topics, mostly related to the three sub-fields of Civil Engineering: Construction, Water and Transport. These courses allow students to orient themselves towards their future specialisation. The panel discussed with the programme to what extent the courses are prerequisite for students to be able to enter certain master tracks at TU-Delft. Although it is not a formal prerequisite, students who wish to enter a certain master track and who did not take a related BSc. elective appear to miss relevant knowledge when they start their master's courses. In this regard, the programme is reconsidering its policies and course structure as well as the improvement of communication towards Bsc. students.

For incoming students, the programme organizes a mentorship programme, which consist of a second-year students mentoring a group of maximum 10 first-year students. Students discuss study progress and other matters and the mentor informs students about the programme and the study mode expected of students. In addition, starting students get a programme manual which explains the programme and informs students about what will be expected of them. Study counselling is available to students who are in need thereof.

The panel discussed the study rates with the programme management and students during the site visit. From the students who continue their studies after the first year, an average of 51% completed their study in four years (based on the academic years 2012-13 until 2014-15). Some mathematics courses and mechanic courses in particular are hard for students. In order to allow students to succeed for these courses, the programme organized additional classes. This didn't provide a solution since students who liked the subject attended the classes whereas those students in need of extra instruction did not attend. The programme keeps seeking ways to accommodate students who have difficulties with these specific subjects without lowering the level of it. The programme has observed student's behaviour and can predict in an early stage and to a certain extent which students run the risk of dropping out or not being able to keep up with the pace of the programme.

From the discussion with the programme management, it also became clear that the programme's coherence in combination with the study load is such that students who fail a course have a high risk of not being able to complete their studies within three years. There are various reasons for this, for example that students cannot start a next course (since the failed course was prerequisite to that

specific course) but also the study load of the programme during some semesters is so high that students do not find time to recuperate their failed course.
The programme is balancing between its ambitions in terms of the programme level on the one hand and the need for students to make progress on the other. The study load of each course is discussed with students and teachers before and after the courses are taught and if necessary, adjustments are made. The programme makes sure that the study-load is evenly spread to avoid a peak in the study load, however, students informed the committee that they experience peaks in their study load, mainly due to some of the previously mentioned courses.

The programme is delivered by staff from the Faculty of Civil Engineering and Geosciences but also from other faculties. From the staff from the Faculty of Civil Engineering and Geosciences, 76% have a PhD in a relevant field. A University Teaching Qualification (UTQ) is obtained by 73% of the staff members teaching in the programme, while 13% is in the process of obtaining their UTQ. The Faculty incorporated the necessity of having a UTQ in its staff promotion policies in order to encourage staff members to obtain their UTQ. The programme uses student assistants in order to guide students and give feedback to students in some of the courses in the Building Site Learning Line. The programme is sufficiently staffed, however, staff members report a high workload.

Considerations
The panel is positive about the teaching and learning environment. It has established that all the courses in the curriculum related to the learning outcomes. The knowledge and skills described in the learning outcomes all are present throughout the courses of the curriculum. The panel encourages the programme to consider to make room for more specialization. Since the field of Civil Engineering is becoming more and more specialised and students can choose from various master programmes, each within a specific sub-discipline of Civil Engineering, the programme should consider create more specialised learning paths in the bachelor programme. This allows the programme to add for example more courses on chemistry and physics to the programme so that students interested in Environmental Engineering will be better prepared for that master programme. The panel is aware that it will not be easy to make room for other courses, since all courses in the programme add to the obtainment of a solid foundation in Civil Engineering and its sub-disciplines.

The programme carefully considered its teaching methods in relation to the learning outcomes. There is a clear coherence throughout the curriculum and the courses are connected within the learning lines and display an increase in complexity. The panel is also very positive about the increased attention for ethics and sustainability within the programme. The study material is up to date and has been developed with great consideration. The course syllabi support an active study behaviour. They provide students with all the necessary information to independently study the relevant material and contain formative assignments which stimulates the students.

The feasibility of the programme could be improved. Due to the level and amount of the materials to be studied by students, the study load of the programme is high. To the panel, the programme appears overloaded, although at the same time, the panel beliefs the programme should not lower its level nor its ambitions. Since the study success rates of the programme are low, the panel encourages the programme to keep: 1) searching for measures that lower the impact of a failed course on the study success rates; 2) making additional efforts to support students who struggle with specific courses; 3) further investigate to what extent (prospective) students with insufficient motivation or capabilities could be fended off. Since the programme is legally not allowed to select students, other measures should be taken in order to endorse a better match between students and the programme. The panel recommends the programme to consider scheduling the elective courses not only in the third but also in the second year: this might take the pressure of the second year.

The panel established that the staff is of good quality and that all relevant disciplines can be taught by experts in their fields. Successful measures have been taken to improve the percentage of staff

members that have obtained their UTQ, however, the panel encourages the programme to further improve these rates. The panel recommends the programme management and faculty management to closely monitor staff members workload and take appropriate measures to diminish the workload if necessary.

Overall, the programme is very well organized and of high quality. The programme shows to be on top of aspects that could be improved and that it takes measures when it should. The panel encourages the programme to continue these efforts.

Assessment of this standard
These considerations have led the assessment panel to assess standard 2, Teaching-learning environment, to be good.

4.3 Standard 3: Student assessment

The programme has an adequate system of student assessment in place.

Findings
The programme's examination and assessment rules are derived from the Faculty's rules and regulations. The main principle on which the assessment system is based is that of constructive alignment, which aims to connect the learning outcomes to the learning goals for each course and the tested knowledge and skills in each course. To this end, lecturers define an assessment matrix for their course which includes the check that all main learning objectives in the exam are listed, including the weight of each topic in the final grade. The actual tests a lecturer develops is related to the assessment matrix. Lecturers with a UTQ are trained in drafting assessments in order to strengthen validity and reliability thereof. In addition, lecturers often discuss their draft exam with colleagues. Students are provided with information on the type of assessment and the way the final grade is determined. In addition, they receive at least one example of a recent test. After each period, all courses are discussed with student representatives, during these discussions, students are asked to give their opinion on the assessment of that particular course.

Assessment methods used in the programme are written exams, computer exams, papers, presentations and group work assessment. In case of the latter, the individual commitment of a student is recognised and free-rider behaviour is strongly discouraged. For most courses, students have the opportunity to take a re-sit in the following period. Courses in the application learning line have mid-period summative exams and have an integral resit at the end of each period. The balance between the various forms of assessment for the programme as a whole is the responsibility of the Director of Studies and the Board of Examiners. The panel established that the programme does not have a coordinating mechanism, such as an assessment plan providing and overview of the assessment methods used in all the courses of the programme.

For the assessment of the thesis, internships and (multi-disciplinary) projects a rubric is used. The assessment of the thesis involves at least two assessors. The panel studies 15 theses and the assessment forms. The assessment forms contain an extended rubric on which methodology is not mentioned as a separate element to be scored upon. The comments on the assessment forms are sometimes more elaborate and sometimes limited. To the panel it was therefore not always clear why a certain grade was given. The panel generally agrees with the grades given, although in some cases the grade could have been higher. There were also two cases where the panel would give a lower grade, either due to the lack of references or due to not addressing the research question in the thesis conclusion. Some theses contain merely a design, other thesis a model or other type of solution to a Civil Engineering problem. Topics of the thesis are sometimes original and some thesis contain elaborate mathematics, mechanics and modelling. The extent to which students reflect on the chosen methodology varies, thesis containing such a reflection are graded higher than thesis not containing such a reflection.

Programme management and the Board of Examiners have taken measures to promote the validity, reliability and transparency of examinations and assessments. The Board of Examiners appoints the examiners and has installed two subcommittees in the academic year 2017-2018. One of the committees spot-check theses work and the other courses. This in order to validate whether the practice of assessment is according to the assessment policies. A recent review of thesis had been done which resulted in a number of recommendations. The panel discussed the outcomes of this review with the programme management and with the Board of Examiners.

Considerations
The panel is positive about the assessment system in place. The programme management sufficiently ensures that tests are valid and reliable and students are informed adequately about the assessment and

grading so that the assessment is transparent as well. Staff members are trained and expected to pay attention to assessment.

The assessment methods are varied and fit to test the knowledge and skills which is expected of students. Student's learning process is stimulated through the use of various assessment methods. The panel suggests the programme to draft an assessment plan for the programme as a whole, in order to enhance the coordination of assessment methods throughout the programme.

The assessment of the thesis is adequate. The panel recommends the programme to consider further improvement of the assessment form and especially pay attention to the reflection on the chosen methodology, strengthening the extent to which all students consider such a reflection an integral element of their (academic) work. The programme should further invest in a common use of the assessment forms so that all lecturers provide a written explanation of the mark given which could be understood by others.

The Board of Examiners performs its duties as it should and is constructive in its advice to the programme management. The panel is positive about the sub-committees which have been installed to spot-check courses and thesis, but finds that this measure has been taken very late in comparison to other institutions where this is regular practice since a couple of years. It is important to establish a structural practice of safeguarding quality in assessment. In addition, the panel recommends the programme management to effectively amplify measures taken and suggested by this Board in order to strengthen the quality of assessment practices and related quality assurance. The roles and duties of this Board could be stronger utilized to strengthen the governance of the quality of the programme as a whole.

Assessment of this standard
The considerations have led the assessment panel to assess standard 3, Student assessment, to be satisfactory.

4 Standard 4: Achieved learning outcomes

The programme demonstrates that the intended learning outcomes are achieved.

Findings
The thesis studied by the panel show that students graduating from the programme are able to research a problem in the field of civil engineering and systematically develop a solution or a design as an answer to the problem. Doing so, students incorporate the relevant (societal) context. Students discuss relevant topics that connect to the various areas in Civil Engineering. Graduates of the programme can enter a broad range of master programmes within the field of engineering, further specializing in one of its subdisciplines.

Considerations
The theses reviewed by the panel show that students have obtained profound knowledge of the fundamentals of Civil Engineering and more specialized knowledge in subareas of Civil Engineering. The students are able to critically think of solutions to problems in Civil Engineering and are able to apply their knowledge in order to develop these solutions. The theses are regarded by the panel to be up to standard. The panel agrees to the grades given by the programme examiners.
The panel observes that extent to which students reflect on the chosen methodology in their thesis varies. The panel recommends the programme to make such a reflection a compulsory element of the thesis. The panel concludes that the programme prepares students adequately for a master programme in the domain of Civil Engineering or related domains. Graduates of the programme do well in master programmes.

Assessment of this standard
The considerations have led the assessment panel to assess standard 4, Achieved learning outcomes, to be satisfactory.

5. Overview of assessments

Standard	Assessment
Standard 1. Intended learning outcomes	Satisfactory
Standard 2: Teaching-learning environment	Good
Standard 3: Student assessment	Satisfactory
Standard 4: Achieved learning outcomes	Satisfactory
Programme	Satisfactory

6. Recommendations

In this report, a number of recommendations by the panel have been listed. For the sake of clarity, the most important ones have been brought together below. The panel recommends the programme:

- to consider drafting the learning outcomes in a more specific way, since these rather generally describe disciplinary knowledge obtained by students;
- to consider measures that improve the extent to which students complete their studies within due time;
- The panel recommends the programme to consider scheduling the elective courses not only in the third but also in the second year: this might take the pressure of the second year;
- to closely monitor staff members workload and take appropriate measures to diminish the workload if necessary;
- to consider further improvement of the assessment form;
- to amplify measures taken and suggested by the Board of Examiners in order to strengthen the quality of the programme;
- to strengthen the extent to which students are required to reflect on the chosen methodology in the thesis.