

Assessment report  
Limited Framework Programme Assessment

**MSc in Civil Engineering**  
Delft University of Technology

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## 1. Executive summary

In this executive summary, the panel presents the main considerations, which led to the assessment of the quality of the Master 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 master programme in Civil Engineering aims to educate engineers who master scientific, technical specialty and generate new information and knowledge through in-depth or multidisciplinary research. Graduates are able to put knowledge into practice on interdisciplinary platforms. The eight tracks on offer comprise the broad field of Engineering and allow students to specialise in one of the subareas of Civil Engineering. The panel observes that the intended learning outcomes cover the content of the programme and tracks within the programme. They are formulated in rather general terms while the programme is structured in specific tracks of which some specialisations within the track. Therefore, the panel recommends to bring more alignment between the structure of the programme and the structure of the learning outcomes. The panel concludes that the academic orientation and master level of the programme are clearly reflected in the intended learning outcomes. Compared to other national and international programmes in Civil Engineering, the programme has a stronger focus on theoretical knowledge and methods. The panel recommends the programme to add a more explicit description of academic reasoning and reflection on methodology as competences to be obtained by graduates. The panel observes that the programme is well aware of its academic and societal context and important developments are reflected in the vision on the programme. In addition, the programme has a good grasp of the level and content of comparable master programmes around the globe. The panel assessed standard 1, intended learning outcomes, as satisfactory.

The programme offers a wide variety of specialised courses to students with a solid background in the disciplines that underpin Civil Engineering. Both national and international students are admitted to the programme. The admission criteria and procedures are clear, but with regard to some tracks the programme's policies regarding the connection between the BSc. programme in Civil Engineering and the MSc. programme need revision so as to better ensure the independent character of both programmes. The structure of the programme is the same for all the tracks. All students follow a course on ethics and write a 40 EC thesis. Within each track students follow a fixed set of compulsory courses and additionally select electives related to their specialisation. The extent to which the courses relate to the learning outcomes has been made clear for the compulsory courses. The panel is positive about the measures having been taken by the programme to ensure the track curricula to be covered by the programme intended learning outcomes and regards these measures to be adequate. The panel is, however, of the opinion more should be done to assure the correspondence between the track curricula and the programme intended learning outcomes, as the number of and the diversity among the tracks is quite substantial. The panel, therefore, recommends the programme to put into place additional procedures assuring the systematic alignment of programme intended learning outcomes and track curricula. The panel observes that the courses provide students with expert knowledge in a wide variety of topics and that the teaching methods and learning activities within the courses are adequate. The 40 EC thesis allows students to further specialize and demonstrate their capability to independently carry out a research project, often in collaboration with industry. The panel recommends the programme to reconsider the amount of credits for the thesis project, which is very high. In addition, the panel recommends the

programme to take measures to improve the study success rate among Dutch students. The panel assessed standard 2, teaching and learning environment, as satisfactory.

The panel considers the assessment of each individual course as satisfactory. The programme management has taken measures to stimulate that tests are reliable and valid and the assessment is transparent to students. 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 comparison to other programmes. The programme has introduced the use of a rubric for thesis grading. The panel has established that the rubric is fit to this end. Staff members provide written comments to students, the extent to which these comments provide a clear justification of the grade varies. The panel recommends the programme to align the extent to which written comments are given. The panel assesses standard 3, assessment, as satisfactory.

The panel has reviewed theses projects and has established that students are capable of independent research of a relevant topic in their specialisation of Civil Engineering. The theses show that students are capable of designing or developing a solution to complex problems. Students prove their analytical skills and ability to synthesise and abstract. In addition, they demonstrate the capacity to develop new information and knowledge. The extent to which students reflect on the chosen methodology varies, theses containing such a reflection are graded higher than theses not containing such a reflection. The panel recommends the programme to give more attention to this aspect. The programme's graduates are successful on the job market and find employment in a variety of sectors. The number of graduates who work in academia or research institutes is relatively high, reflecting the programme's strong focus on theoretical knowledge and methods. The panel assessed standard 4, achieved learning outcomes, as satisfactory.

The panel that conducted the assessment of the Master programme in 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 Master 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;
- Prof. Dr. Ir. Geert de Schutter, Professor of Concrete Technology, Ghent University;
- Ir. Adriëne 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 was 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: M Civil Engineering  
Orientation, level programme: Academic Master  
Grade: MSc.  
Number of credits: 120 EC  
Specialisations: Building Engineering  
Hydraulic Engineering  
Structural Engineering  
Transport and Planning  
Water Management  
Geo-Engineering  
Geoscience and Remote Sensing  
Environmental Engineering  
Location: Delft  
Mode of study: Full-time (language of instruction: English)  
Registration in CROHO: 21PF-60352  
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.
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#### *Findings*

The Master Civil Engineering of Delft University of Technology (TU-Delft) is a two-year (120 EC), master programme in the domain of Civil Engineering. TU-Delft offers in addition a Bachelor programme in Civil Engineering and several other Master programmes in this domain, among which the Master in Construction, Management and Engineering and the Master in Transport, Infrastructure and Logistics.

The programme's objectives are to educate engineers who master scientific, technical specialty, generate new information and knowledge through in-depth or multidisciplinary research and are able to put knowledge into practice on interdisciplinary platforms. Although the complexity of Civil Engineering activities has increased over the years, the three core areas within Civil Engineering, which are Water, Structures and Transport, still can be considered as the three core areas of Civil Engineering. The programme offers students the opportunity to specialise in one of these core areas and related areas by offering students a variety of tracks. Some of these tracks are offered in close collaboration with the master programme in Applied Earth Sciences (also offered by the Faculty of Civil Engineering and Geosciences), such as the track in Environmental Engineering which was launched in 2016. Some tracks have a special character because they are part of an Erasmus Mundus programme or offered in conjunction with the National University of Singapore.

The programme drafted the learning outcomes in accordance with the Meijers Criteria, which have been developed by the 3TU Federation and are related to the Netherlands Qualification Framework (NQLF). In addition, and in order to be better able to make an international comparison, the programme also drafted learning outcomes in terms of the Dublin Descriptors. The learning outcomes thus address knowledge and understanding, the ability to apply knowledge, the ability make a judgement, communication skills and learning skills. The panel discussed with the programme the extent to which students are required to involve academic reflection on their work. To the panel, academic reflection involves reflection on the methodologies chosen to gather data and to solve a problem. Many representatives of the programme considered academic reflection a reflection on the research process or design process, a more applied definition of reflection. The panel also discussed the rather broad character of the learning outcomes for the programme as a whole in relation to the specified knowledge and skills students obtain in the various specialisations on offer. The programme is aware that the learning outcomes are formulated rather general. The programme intended learning outcomes have been drafted in these general terms to cover the content of the tracks, to address the breadth of the professional field and to allow some degree of flexibility in adapting to changes in this 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 the programme are comparable to those of other programmes. The programme distinguishes itself from other programmes by a stronger focus on theoretical knowledge and methods, including modelling. The programme finds support for these statements in comments from international students from all over the world. These

students additionally mention the more in-depth modelling in fundamental courses and the focus on analysis and critical reflection on results in projects as a distinctive feature of the programme.

During the site visit, the panel took notice of the Faculty-wide policies in which the programme resides. The focus of the Faculty which also applies to the programme is that the graduates build for people and society. With regard to society, the vision of the Faculty defines 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 TU-Delft as well as the ample connections to business and governmental organisations allow the programme to stay up to speed with relevant developments. 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 Opleiding Civiel-Ingieurs en Bouwnijverheid). Representatives of the professional field expressed their appreciation for the programme's learning outcomes during the site visit and especially mention the attention for digitalization in this respect.

#### *Considerations*

The panel concludes that the intended learning outcomes of the programme reflect a master's level and have a clear academic orientation. The programme is embedded in a strong environment in terms of research capacity within the University and connections to the professional field. The panel appreciates the effort the programme made to draft its learning outcomes in terms of the Dublin Descriptors. The panel sees room for improvement of the intended learning outcomes in two aspects. Although the learning outcomes reflect a clear academic orientation, the extent to which learning outcomes address academic reasoning and reflection on methodology could be stronger and have a more academic focus, instead of the more applied approach to reflection as expressed by representatives of the programme. The second aspect regards the relation between the intended learning outcomes of the programme and the programme's content. The panel has established the programme intended learning outcomes to cover the content of the programme and the tracks within the programme but recommends, however, to bring more alignment in the structure of the learning outcomes and the structure of the programme. This could for example be done by drafting specific intended learning outcomes for each of the tracks to clarify the relations with the overall programme intended learning outcomes, but might also include a reconsideration of the tracks on offer.

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 concludes that the programme is well aware of the content, teaching methods and level of Civil Engineering Educational programmes across the globe.

#### *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*

#### *Organization, admission and student population*

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. programme 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 Bachelor programme in Civil Engineering and the programme of Applied Earth Sciences.

The programme admits students with a relevant BSc. degree from a Dutch university. International students additionally need a cumulative Grade Point Average of 75% of the scale maximum and sufficient mastery of the English Language (IELTS 6.5, TOEFL 90). Decisions on the admittance of international students is organized per track. Students with a Civil Engineering bachelor degree from a university of applied science are admitted to a pre-master programme after completion of an English Language test and a mathematics test.

The number of students entering the programme has been about 400 students per year over the last three years, with 30% to 35% of the students having an international background. To the programme, a mix of 60% national students and 40% international students is an optimal balance in terms of quality of education and level of the programme. In the year 2016-2017, the percentage of female students in the programme was 27%.

Students choose their track based on the information about the tracks they have received during their BSc. programme (in case they did their BSc. in Delft). International students inform themselves on the website of the programme. The programme listed the division of students over the eight tracks on offer by the programme. The overview shows that the tracks in Structural Engineering and Hydraulic Engineering as well as Water Management are popular and chosen by respectively 24%, 34% and 14% of the students. Tracks in Transport and Planning Geo-Engineering and Geoscience and Remote Sensing have respectively 8%, 8% and 2% of the students. During the site visit, the panel was informed about an online study programme for which students can obtain a degree. This programme was not mentioned in the self-evaluation of the programme because it will be terminated when the student still enrolled in the programme finishes the programme. The courses of this programme are equal to the regular programme and are offered online. The reasons for termination of this programme are concerned with university-wide policies regarding online education.

Several tracks within the programme offer electives which are also on offer in the bachelor programme. Students who took these courses during their bachelor's programme, cannot take these courses as part of their master programme and choose other courses. Some courses on offer in the elective space of the Bachelor Programme in Civil Engineering are prerequisite to courses offered in the Master programme. During the site visit, the programme management informed the panel that it is reconsidering its policies and course structure in order to improve the extent to which the tracks are open to more students than

those that have been able to take specific courses in the Bachelor programme of Civil Engineering and in order to ensure that all admitted students have a comparable level of prerequisite knowledge at the start of the programme.

### *The programme*

Students take 56 EC-courses related to the chosen track (these are generally divided into core courses and courses belonging to a specialisation within each track), they take 10 EC electives and have 10 EC in various options (study abroad, follow more courses in conjunction with their track, do an internship or take on an additional master thesis project). In addition, students choose a 4-EC course in Ethics, among two courses on offer. Students conclude with writing a 40-EC thesis, consisting of a final project and the writing and presentation of a thesis. Most students collaborate during their final project with an organization in the professional field. The panel discussed whether the thesis should comprise 40 EC. The programme envisions the thesis as the signature of the student. It allows students to develop themselves in a professional and academic way and to distinguish themselves from other students. In addition, the thesis is seen of high importance to the extent to which students develop a reflective approach and practise critical engineering.

The thesis is supervised by a committee of at least three members, who represent at least two research groups. At least two members should have obtained their University Teaching Qualification (UTQ), the third member is often an external member from the industry. The final project is carried out within a strict planning, providing a clear structure and indicating decisive moments in the process of writing and supervision.

To ensure that each of the track curricula are covered by the intended learning outcomes of the programme, the following measures have been taken by the programme: (i) when tracks or specialisations are introduced or substantially changed, the Board of Examiners checks the programme against the learning outcomes; (ii) students can discuss their study path with the track coordinator (iii); the course descriptions in the study contain information on the content and goals of the courses; (iv) the Board of Studies (in which all tracks are represented) assists in ensuring a regulated development of the programme by discussing the necessity of the courses; (v) significant changes in the programme are discussed and are reported to the Director of Education who reviews these changes.

The coherence of the programme is provided by the offer of specialisations within tracks so that the courses taken by students are clearly focused. In addition, the scheduling of track's compulsory courses is at the beginning of the programme so that courses in the specialisations build forth on the knowledge obtained by the students in an earlier stage of the programme. This structure in addition allows the students to orient on the specialisations on offer by the track (in case the track offers specialisations). The panel has established that the courses on offer in tracks are recently updated and students gain state-of-the-art knowledge in these courses. In most of the courses, students work on large and complex assignments. Group sizes vary but groups are relatively small so that lecturers are able to use interactive methods in teaching and enhance the students' active participation. Courses which are offered in cooperation with the National University of Singapore (a specialization within the Hydraulics track), are listed in the study guide and thesis and examination regulations.

The programme provides an international setting, with an increasing number of staff members from abroad. In addition, students take the opportunity to study abroad. The international students of the programme generally complete their programme in two years. Dutch students tend to delay their studies. Dutch graduates from the cohorts 2012-2013, 2013-2014 and 2014-2015 spent an average of 2.8 years on

their studies. The figures were produced when a considerable number of the 2014-2015 cohort students is still expected to graduate.

### *Staff*

The programme is delivered by staff from the Faculty of Civil Engineering and Geosciences but also from other faculties. Of the programme's staff members who are part of the Faculty of Civil Engineering and Geosciences, 79% have a PhD in a relevant field, and a considerable number is full professor. A University Teaching Qualification (UTQ) is obtained by 60% of the staff members teaching in the programme, while 20% is in the process of obtaining their UTQ. The Faculty incorporated the requirement of having a UTQ in its staff promotion policies in order to encourage staff members to obtain their UTQ. In addition, the programme aims to raise the number of female staff members so that it closer reflects the number of female students. The Faculty requires mastery of the English level on level C1 by all lecturers in the programme. Currently 70% of the staff meet this requirement and the status of 15-20% is unknown.

Some tracks of the programme are popular and chosen by a large number of students. This results in a high workload for staff members. Especially the Hydraulic department and the Soil Mechanics department suffer from this. The workload has the attention from the programme management. One of the measures is the start of a taskforce that amongst others will advise on how to promote less popular tracks and which will also consider providing specific tracks with a cap on student numbers.

### *Considerations*

The panel concludes that the admission policies are adequate and are communicated to prospective students. The admission criteria and procedures are clear, but with regard to some tracks the programme's policies regarding the connection between the BSc. programme in Civil Engineering and the MSc. programme need revision. The panel recommends the programme management to improve the extent to which the tracks are open to more students than those that have been able to take specific courses in the Bachelor programme of Civil Engineering and in order to ensure that all admitted students have a comparable level of prerequisite knowledge at the start of the programme.

The panel is positive about the measures having been taken by the programme to ensure the track curricula to be covered by the programme intended learning outcomes and regards these measures to be adequate. The panel is, however, of the opinion more should be done to assure the correspondence between the track curricula and the programme intended learning outcomes, as the number of and the diversity among the tracks is quite substantial. The panel, therefore, recommends the programme to put into place additional procedures which assure the systematic alignment of programme intended learning outcomes and track curricula

The panel observes that the programme per track is structured in a logical way. The core courses per track provide students with knowledge and skills that allow them to orient them on their area of specialisation. Both the core courses and the specialisation courses offer students in-depth and state of the art knowledge. The programme allows students to explore their interests and develop their own learning path.

The panel is positive about the structure of the thesis process provided by the programme, as well as the supervision received by students during their project and the writing of the thesis. The panel supports the programme's vision on the thesis but recommends the programme to reconsider the amount of credits provided for the thesis. In addition, the panel strongly recommends the programme to take measures regarding the study success rate of Dutch students.

The programme's connection to the research groups of the university ensure that students are taught by staff members who are aware of relevant developments within science. In addition, the programme has ample connections to the professional field. Staff members are experts in their field and some of the staff members have an excellent track record. However, the number of staff members that obtained an UTQ is rather low (60%). The panel is positive about the efforts taken by the Management of the University to improve this rate. It also praises the University's management for aiming to improve the extent to which the gender balance in the staff team reflects the balance of the student population. It recommends the programme to hire more staff in order to better equip the research groups that suffer from a very high workload.

The panel concludes that the programme is up to standard and in some respects above standard, however it also sees room for further improvement.

*Assessment of this standard*

These considerations have led the assessment panel to assess standard 2, Teaching-learning environment, to be satisfactory.

### 4.3 Standard 3: Student assessment

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

#### *Findings*

The programme 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 indicate how these learning goals are assessed. 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, and defines the weight of each topic in the final grade. The actual test a lecturer develops is based on this assessment matrix. The panel has observed (see standard two) that the relation between the learning outcomes and the courses objective are not systematically indicated: as a result it is unclear to what extent the programme's learning outcomes are assessed in the non-compulsory courses of the programme.

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. The programme has recently implemented a more systematic implementation of the four-eye principle.

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. The quality assurance processes contain both a questionnaire and focus groups. Evaluations are held after every period.

Assessment methods used in the programme are written exams, papers, presentations, group work assessment and oral exams. In case of group work, 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. The assessment of the online programme is a combination of online assessment with assessments for which students have to be physically present. 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.

For the assessment of the thesis, the programme recently developed a new rubric. The rubric provides lecturers with the criteria to score the thesis on. The panel studied 15 theses and the assessment forms. The panel generally agrees with the grades given and notes subtle differences in grading by representatives from various departments and research groups.

The Board of Examiners appoints the examiners and has installed two subcommittees in the academic year 2017-2018. These committees review samples of theses and courses in order to validate whether the practice of assessment is according to the assessment policies. Recently, review of a sample of theses has taken place and resulted in a number of recommendations. The panel has observed that the outcomes of this review have been discussed with the programme's management and with the Board of Examiners.

#### *Considerations*

The panel concludes that the programme management sufficiently ensures that for individual courses the tests are valid and reliable and that students are informed adequately about the assessment and grading. Staff members of the programme are trained in assessment and expected to pay attention to the quality of assessment. The assessment methods are varied and fit to test the knowledge and skills which is expected of students. The assessment of the thesis is adequate. The panel recommends the programme to organize

calibration of the thesis grading, to further enhance consistent grading over staff members from various research groups. In addition, the panel recommends to enhance a coherent use of the well-developed rubric provided to this end. The panel has observed that students do get elaborate oral feedback during the graduation ceremony.

The Board of Examiners performs its duties as it should. The panel is positive about the sub-committees which have been installed to review samples of courses and theses, although this measure has been taken very late. In other institutions, this is regular practice since a couple of years. 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.

#### 4.4 Standard 4: Achieved learning outcomes

The programme demonstrates that the intended learning outcomes are achieved.

##### *Findings*

The programme provides an overview of the sectors in which its alumni find a job, based on a database containing 448 alumni of the track in Hydraulic Engineering, which is representative for the job market of the tracks in Structural and Building Engineering. The figures show that 55% of the alumni work as a consultant or contractor and 16% of the alumni work in jobs in a research institute, academia or in education.

The self-evaluation contains information generated by the alumni questionnaires, showing that the vast majority (96%) of alumni is satisfied or very satisfied with the programme. Unemployment rates are low and half of the graduates find a job position within 3 months after graduation. During the site visit, alumni stressed the extent to which students are taught to work on solutions in a systematic way, investigating step by step all aspects of a certain problem. The programme has signalled that international students are hired more often in comparison to what used to be the case. Representatives of the professional field state also that in comparison to other Dutch programmes, graduates from this programme are more likely to perform projects abroad.

The panel studied 15 theses. 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, theses containing such a reflection are graded higher than theses without such a reflection. The average grade of the MSc. Theses is approximately 8.0. Students successfully compete in national and international thesis awards: every year a number of students is awarded.

##### *Considerations*

The panel concludes that the theses it has studied, demonstrate that students have obtained an academic approach and a master's level. Students show to be capable of designing or developing a solution to complex problems, they give proof of being highly analytical and they demonstrate possess the ability to synthesise and abstract. The theses provide new information and knowledge and a number of students show to be able to reflect deeply on the chosen methodology. The panel considers students completing the programme to have reached the intended learning outcomes. The panel recommends the programme to pay more 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 is aware of the appreciation of alumni for the programme as well as of the appreciation of the professional field for the graduates delivered by the programme. Graduates of the programme successfully pursue a career within the field of Civil Engineering and a considerable number of graduates continue their study with a career in academia.

##### *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	Satisfactory
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 bring more alignment between the structure of the programme and the structure of the learning outcomes;
- to include a description of academic reasoning and reflection on methodology as competences to be obtained by graduates;
- to carefully consider the independency of the Bachelor and the Master programme in Civil Engineering;
- to reconsider the amount of credits for the thesis project;
- to put into place procedures to assure the systematic alignment of the programme intended learning outcomes and the track curricula;
- to take measures to improve the study success rates of Dutch students;
- to amplify measures taken and suggested by the Board of Examiners in order to strengthen the quality of assessment practices and related quality assurance ;
- to consider to make an explicit reflection on the chosen methodology a mandatory element of the thesis, strengthening the extent to which all students consider such a reflection an integral element of their (academic) work.