

Qualification Title: New Zealand Diploma in Engineering with strands in Civil Engineering, Electrical Engineering, Electronic Engineering, Mechanical Engineering and Fire Engineering

Qualification number: 2612

Date of review: 8 October 2018

Final decision on consistency of the qualification: National Consistency Confirmed

Threshold:

The threshold to determine sufficiency with the graduate profile was determined as evidence that:

Graduates, in their *specialist field*¹, will be able to:

- competently perform technical operations to the standards, ethical and professional responsibilities required by the engineering profession²
- work collaboratively within team environments to provide a comprehensive engineering service
- carry out engineering activities whilst applying the requirements of the Health and Safety in Employment Act and taking into account the Resource Management Act and the principles of the Treaty of Waitangi within the relevant contexts
- apply engineering theory to practice working within *well-defined engineering problems*³
- use their engineering knowledge to make informed problem-solving decisions and implement these decisions and
- identify, evaluate and manage risks within *well-defined engineering problems*.

Notes

1 The *specialist field* is defined as one of the five qualification strands: Civil, Electrical, Electronic, Mechanical or Fire Engineering.

2 As per the Dublin Accord 2002

3 *Well-defined engineering problems* can be solved in standardised ways, are frequently encountered and hence familiar to most practitioners in the specialist area, have consequences that are locally important but not far-reaching and can be resolved using limited theoretical knowledge but normally require extensive practical knowledge.

Tertiary Education Organisations with sufficient evidence

Tertiary Education Organisation	Final rating
Unitec Institute of Technology	Sufficient
Ara Institute of Canterbury	Sufficient
Wellington Institute of Technology (WeITec)	Sufficient
Northland Polytechnic NorthTec	Sufficient
Nelson Marlborough Institute of Technology (NMIT)	Sufficient
Southern Institute of Technology (SIT)	Sufficient
Aspire2 International Business and Technology Limited	Sufficient
Toi Ohomai Institute of Technology	Sufficient
Waikato Institute of Technology (Wintec)	Sufficient
Western Institute of Technology at Taranaki (WITT)	Sufficient
Universal College of Learning (UCOL)	Sufficient
The Open Polytechnic of New Zealand	Sufficient
Manukau Institute of Technology	Sufficient

Introduction

The purpose of this Level 6 qualification is to provide the engineering industry with engineering technicians specialised in civil, electrical, electronic, mechanical or fire engineering. Graduates will be capable of operating at a technician level scope of practice as outlined by the Dublin Accord (International Engineering Alliance, 2002). Graduates require 240 credits to be awarded this qualification.

The education pathway from this qualification would see graduates going onto study towards a technologist degree such as a Bachelor of Engineering Technology, or a professional engineering qualification such as a Bachelor of Engineering. Whilst the employment pathway from this qualification would see graduates gaining employment as engineering technicians in workplaces that have a technical/engineering basis relevant to their specialist engineering strand (civil, electrical, electronic, mechanical or fire).

The New Zealand Board of Engineering Diplomas (NZBED) is the qualification developer. NZBED was formed as a recommendation from the National Engineering Education Plan (IPENZ & TEC, 2010), and has the objective of “ensure engineering education for technicians at Level 6 meets the needs of industry and other tertiary providers offering higher level engineering qualification” (NEEP Report, p 19). The Board provides governance, guidance and management of the educational quality of the unified diploma system. In addition, NZBED accredit the education organisations who award this qualification and manage the external moderation of assessments.

Following the development of the first version of this qualification in 2015, the NZBED developed a National Curriculum Document, and this has become the single approved Programme of Study leading to the award of the qualification for all education organisations

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accredited to offer this Curriculum. This curriculum is supported by a Handbook providing guidance for organisations as they deliver their programmes of study.

There have been 891 graduates reported for the period 01 January 2014 - 31 December 2017 (data taken from education organisation Self-Assessment reports).

Whilst the civil engineering field has been the recipient of the largest number of these graduates, the electrical, electronic and mechanical engineering specialist fields have all had graduates from the programme/strands. The newest strand, added in version 2 of the qualification, Fire Engineering, has not been offered and therefore has no graduates. Organisations reported that their graduates were both domestic and international students (the split was not reported), with the one private training establishment graduating only international students. Most organisations reported that some of their students were working in the engineering industry and studying the qualification part-time.

This was a co-review, with the Reviewers moderating submissions prior to the meeting to ensure consistency of pre-meeting views and final judgements of sufficiency of evidence.

The review meeting was attended by a representative from each provider, an observer from a provider yet to have graduates, representatives of the NZBED and its Quality Assurance Committee, and a Consistency Reviewer observing for training purposes. Organisations verbally presented their case, supported by their Self-Assessment reports and evidence portfolios, that their graduates had met the graduate profile outcomes.

Evidence

The education organisations provided a range of evidence to demonstrate that their graduates met the graduate profile outcomes.

The criteria used to judge the evaluation question were:

- The nature, quality and integrity of the evidence presented by the education organisation
- How well the organisation has analysed, interpreted and validated the evidence, and used the understanding gained to achieve actual or improved consistency
- The extent to which the organisation can reasonably justify and validate claims and statements relating to the consistency of graduate outcomes, including in relation to other providers of programmes leading to the qualification

Programme evidence:

The NZBED has detailed quality systems to ensure the management of consistency. These systems, processes and outcomes contribute a range of valuable evidence, applicable to all organisations. This evidence was presented in the provider's self-assessment report, associated evidence portfolios and presentations at the review meeting, albeit with differing emphasis, and weightings, depending on the quality of their results, particularly in the national moderation process.

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This evidence includes:

- The National Curriculum Document - Programme of Study approved by NZQA, and the common Operations Manual, which must be adhered to by all organisations. The curriculum includes mapping of courses, learning outcomes, assessment activities with the graduation profile, as well as to the Dublin Accord. This curriculum has common course descriptors, is reviewed on a regular basis, and provides a level of assurance of consistency of programme content and outcomes across all organisations.
- Accreditation process managed by the Engineering New Zealand (previously known as the Institute of Professional Engineers (IPENZ)). This robust process is undertaken prior to organisations commencing delivery of the programme, for the introduction of new strands, and thereafter on the five-yearly cycle. NZQA requires NZBED to supply a letter of support for this accreditation process confirming adherence with Curriculum and related Operations Manual. Those organisations who had recently been through the accreditation process presented their reports and commendations as part of their evidence portfolio.
- The requirement to have two key capstone assessments, Engineering Practice and Engineering Management. These are mapped to all of the qualification's six Graduate Profile Outcomes, as well as the Dublin Accord's twelve Graduate Attributes, and for the purposes of this review were given significant weighting across the evidence portfolios.
- Common national examinations, for other courses/strands (excludes capstone). These provided further assurance of consistency.
- A national moderation system, incorporating the key capstone assessments annually, and other courses on a scheduled basis. A Moderation panel reviews assessment material prior to use (pre-assessment moderation), and tutor judgements (post-assessment moderation) and provides detailed feedback to organisations. This is a robust process, and functions as both a compliance and continuous improvement process. The moderation panels identify assessment materials that can be used as exemplars and make these available on the NZ Diploma in Engineering Moodle page. Moderation results for the two capstone assessments (referred to above) were treated as a key source of evidence for this review.
- The NZBED Quality Assurance Committee, with membership from the Board, Institutes of Technology and Polytechnic's (ITPs) and Industry Training Organisation (ITO) quality and delivery representatives, and the Executive Officer provide overall monitoring of provider evaluative activity and graduate outcomes. NZBED representatives at the meeting commented on these activities as relating to the evidence and organisations submissions.

Additional programme evidence included:

- Internal moderation processes and results. Most education organisations presented this evidence and were able to demonstrate robust processes were used internally to

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moderate material and assessment judgements based on a moderation schedule. There were however a few organisations who didn't not include this evidence as they hadn't considered this relevant and relied on the evidence from their national moderation results.

- Internal self-assessment and programme review reports showing the continuous improvement cycle and updating of delivery resources and assessments. This evidence was provided by the majority of organisations, and in some cases highlighted good practices, as well as gaps requiring attention.
- One organisation used a Graduate Attribute Portfolio - a requirement that prior to graduating, students present a portfolio of evidence showing their progress towards fulfilling the requirements of the graduate attributes for the qualification and the Dublin Accord. Evidence is drawn from course work and work done or experiences outside of the course.
- Another used a Work Readiness Review - an assessment of how well work-readiness skills are being embedded into the NZ Diploma in Engineering programme, and the impact the teaching strategies and programme resources have at the graduate outcome level, based on the institution's Teaching and Learning strategies.

Stakeholder and Employer evidence

Survey results and other feedback

In preparation for this Consistency Review earlier in 2018, the NZBED designed an Employer/Graduate survey, and made this available for organisations to implement. Nine organisations took up this survey, providing their graduates and employers the opportunity to respond using Survey Monkey, over a period of two months. The response rates were low - 77 graduates and 15 industry/employer responses. In most cases, individual education organisation response rates, were not representative of their graduate cohorts, nor employers, and this impacted on the validity of results and the confidence of this evidence to justify claims that graduates met the qualification outcomes. Some organisations adapted the survey by either reducing the number of questions, and/or aligned questions to the graduate outcomes, as well as made direct contact and conducted phone interviews, often achieving better results. Surveys with questions aligned to the six graduate profile outcomes were more useful, and when well analysed and reported, produced some valuable insights, particularly in relation to graduate profile outcome 3, (refer to conclusion). However, initially other organisations had not made sense of their results, particularly at the individual graduate outcome level.

Industry connections

Close industry connections were presented by most organisations, and evidenced through Advisory Committee memberships, meeting minutes, and activities, hosting of engineering fairs, and facilitating job matching, relationships at a tutor level, and anecdotal reporting of graduate destinations. Some organisations include industry representatives on assessment panels for the capstone projects, providing industry sector input and judgements of these

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critical assessments. A small number of organisations had noted in external accreditation reports and internal programme review documents the need to build these connections.

Graduate feedback and destination evidence

Destination data, including the number of graduates in employment and in some cases a list of employing engineering firms was presented by most organisations, an indication the majority of graduates are getting jobs in their specialised areas. However, the quality of this data was highly variable. For many organisations, this data didn't provide a complete picture of their graduate's destinations post completion, as they had only recently begun to collect this information systematically, and many are still considering the most effective strategy to use with an industry that is not responsive to surveying. This destination data would be enhanced if links were established between the graduate, their role, the employer, engineering sector, location and size of business.

Some organisations reported graduates following the education pathway, now studying a higher engineering qualification such as a Bachelor of Engineering Technology or Professional Engineering at their own institutions, another organisation, or at New Zealand University. Additionally, a small number of organisations reported on graduates working in another jurisdiction, demonstrating that the alignment of the NZ qualification with the Dublin Accord is beneficial and providing access to international work opportunities for New Zealand graduates overseas.

Some organisations, with small numbers of graduates, due to the short timeframe since commencing the new qualification, had collected evidence from current students' cohorts as a proxy to graduates, and in these situations that evidence was considered valid and provided some useful insights.

How well does the evidence provided by the education organisation demonstrate that its graduates match the graduate outcomes at the appropriate threshold?

The thirteen organisations presented a range of evidence, whilst there was some variability in the presentation of the evidence and the analysis, all were able to make a convincing case that their evidence demonstrated their graduates had met the graduate outcomes at the appropriate threshold. This is within the context of a nationally consistent programme, resources, examinations and guidance material, as well as the two mandatory capstone assessments providing coverage of all six graduate profile outcomes, and a robust national moderation process to assure the quality of assessment material and assessor judgements.

The NZBED is an active and well organised national collaboration between the industry, and organisations, who all share a strong stake in the competence and consistency of the qualification graduates. NZBED has clear procedures in place, including managing the national moderation process, which provides confidence in the quality of assessment of graduates, and that the graduate profiles are being met at the national standard. The moderation results for the two capstone assessments were considered key evidence. Some organisations had exemplary performance in this quality assurance process providing high levels of confidence in their assessment and supported their claim that graduates met the graduate profile. In other cases, results had been variable, however most organisations produced evidence in their submissions to show issues, had or were, being addressed.

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In addition to the detailed quality systems of the NZBED, the professional body, Engineering NZ, reviews the organisations as part of their accreditation process, on a five-yearly cycle. For those organisations who had recently been through this external quality assurance process, this evidence supported their claims that graduates met the graduate profile.

Graduate and employer feedback was the other key evidence collected and presented that supported to varying extents that the graduates match the graduate outcomes at the appropriate threshold. Whilst response rates to surveys were generally low, and in some cases survey questions had not been aligned with graduate outcomes, or results were not well analysed and reported, graduates and employers, to a lesser degree, expressed confidence that they met all or most of the graduate outcomes.

Some organisations identified a theme with GPO 3 – “*Apply the principles of the Treaty of Waitangi, the Resource Management Act and Health and Safety in Employment Act while carrying out engineering activities*”, as the available evidence was indicating lower levels of confidence from graduates and their employers in this outcome. One provider had conducted further investigation which contributed to the discussion about this at the meeting. This was reflected in the agreed threshold for the review, and in organisations proposed strategies to enhance delivery and assessment of this outcome going forward.

Where graduate numbers were small, current students’ views were used as proxies for graduates. This evidence provided a useful indication of the progress towards achievement of the graduate profiles. Graduate destination data generally indicated graduates were gaining employment, and some organisations reported that employers were actively seeking graduates. This evidence added support to claims that graduates met qualification outcomes.

All organisations presented evidence of their engagement with industry at a local level. In some cases, this evidence was stronger and indicated a closer connectivity that in others, where it is obvious further work is needed to strengthen these ties. Generally, this evidence supported claims that graduates met the outcomes and were fit for purpose.

Examples of good practice

- The New Zealand Board of Engineering Diplomas (NZBED) collaboration, and structure provides an effective oversight of this qualification by the key industry stakeholders. The effectiveness of the structure is reflected in the range of quality assurance processes in place, the provider’s active participation in meetings and the various examples of ongoing improvements with curriculum and assessments. This arrangement provided a high level of confidence in the moderation processes and the validity of the assessment results.
- Organisations using the Consistency Review meeting as a learning opportunity, and presenting well thought through post-meeting reflections, detailing planned improvements.
- Use of radar charts, by one provider, to show triangulation of survey data. These charts give clear and easily interpreted indication of alignment of responses from graduates and employers.

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Issues and concerns

Many of the Self-Assessment reports relied on stating the evidence available and attaching this as appendices to the report. These would have benefited from more analysis and demonstration of the links between the evidence and the claim that graduates met the graduate outcomes. It was obvious to the Reviewers, that the discipline required by having a limited time (10 minutes) to present their case, resulted in more cohesive and convincing cases being put forward by the majority of organisations at the meeting. It was also noticeable that the practice exercise organised by the NZBED in preparation for the Consistency Review had sharpened the focus on graduate outcomes, however it was disappointing that this didn't transfer in the Self-Assessment practice and report presentation.

Both NZBED and the organisations need to consider how they are going to improve the quality of feedback, and particularly to increase the response rate of surveys given the concerns about survey fatigue in the industry.

Recommendations to Qualification Developer

None as the qualification has recently been reviewed.