REGISTRATION AUTHORITY
FOR CHARTERED PROFESSIONAL ENGINEERS

Design Verifier

Assessment Guidance

February 2025

Contents

Introduction

Design verifiers review the design of hazardous equipment to ensure safety by compliance with relevant local and international codes and standards. In New Zealand, the design verification of certain categories of equipment is regulated under the Health and Safety in Employment (Pressure Equipment, Cranes, and Passenger Ropeways) Regulations 1999 (PECPR regulations 1999).

Chartered Professional Engineers seeking to register as Design Verifiers must demonstrate competence in both design and design review within one or more equipment categories. Design verifiers in New Zealand are typically employed or engaged by:

» An accredited Inspection Body recognised by WorkSafe NZ, or
» A company approved by WorkSafe NZ to conduct in-house design verification (i.e., holding a current letter of exemption for in-house design verification).

The qualification issuing agency for design verifiers under the PECPR framework is Engineering New Zealand. This document provides applicants with guidance on the competence assessment process for registration as a design verifier.

Equipment categories

Engineering New Zealand issues annual practising certificates for design verifiers under the PECPR, divided into three equipment categories:

1. Pressure Equipment
2. Cranes
3. Passenger Ropeways.

Design verifiers are assessed by Engineering New Zealand as Chartered Professional Engineers (CPEng). The usual CPEng assessment process is followed (please refer to the CPEng assessment guidance documents), with competency as a design verifier assessed in addition, as part of this process. Assessment as a design verifier can take place concurrently with assessment as a Chartered Professional Engineer (CPEng) or may be undertaken by applicants who are already a CPEng.

Upon successful assessment, design verifiers are awarded both CPEng and Design Verifier practising certificates.

The engineer's practice area description will include the relevant wording:

» Design Verification of Pressure Equipment; or/and
» Design Verification of Cranes; or/and
» Design Verification of Passenger Ropeways.

Equipment types

In the design verifier's practice area description, the type of equipment needs to be further described. Examples are provided below.

Pressure equipment

Design verifiers for pressure equipment should be qualified for at least one of:

» Design Verification of Pressure Equipment (Pressure Piping)
» Design Verification of Pressure Equipment (Pressure Vessels)
» Design Verification of Pressure Equipment (Boilers).

Types of pressure equipment are listed in the WorkSafe NZ Approved Code of Practice for Pressure Vessels (Excluding Boilers), and Approved Code of Practice for Boilers. Heat Exchangers (those that are not defined as boilers), are generally considered to be within the Pressure Vessel type.

Cranes

Types of cranes are listed in the WorkSafe NZ Approved Code of Practice for Cranes. The engineer's practice area description should include the wording "Design Verification of Cranes" and the practice area description should make clear the type of cranes in which the engineer has expertise. Other descriptions for types of equipment, not listed in the ACOP documents, may also be appropriate. For example, local crane code AS1418 is divided into various parts, which the assessment panel may wish to use as guidance. In general, typical descriptions for types of cranes for practice area description are:

- Mobile Cranes
- Tower Cranes
- Self-erecting Tower Cranes
- Truck Loader Type Cranes
- Tractor Cranes and Side Boom Pipe layers
- Gantry Cranes, usually considered to include Bridge, gantry, portal (including container cranes) and jib cranes (eg AS1418.3) and monorails (eg AS1418.18).

The assessment panel may consider other descriptions for equipment types, or further subcategorisation of the types listed above, if they believe this would better characterise the applicant's area of competence. It is recommended that, where possible, the equipment descriptions are kept as broad as possible.

Passenger ropeways

Types of passenger ropeways are listed in the WorkSafe NZ Approved Code of Practice for Passenger Ropeways.

Successful applicants will receive an assessment report from Engineering New Zealand, containing the assessed practice area description. This practice area description may be supplied to interested parties such as WorkSafe NZ, or IANZ, to show what type of equipment the assessment panel has assessed the engineer to be competent to perform design verification of.

Design Verifier public register

Engineers registered as Design Verifiers will be published on our online register. The register is searchable on the equipment category of Design Verifier and will soon include location as a search function. We encourage registered Design Verifiers to publish their service location and contact email address.

Eligibility

A Design Verifier must be registered both as a Chartered Professional Engineer and Design Verifier with Engineering New Zealand. The Design Verifier title is open to professional engineers who:

» are currently registered as a Chartered Professional Engineer, or eligible to apply to be a Chartered Professional Engineer (you can apply for Design Verifier and CPEng at the same time)

» are able to practise competently in the area of practice for the specific category of Design Verifier registration, as detailed in Appendix 1 of this document

» have relevant experience in and knowledge of Design Verifier engineering, and able to demonstrate competence. Typically, applicants are expected to have at least 5 years' experience in design and analysis of the equipment category being applied for.

You don't need to be a member of Engineering New Zealand to apply.

How to apply

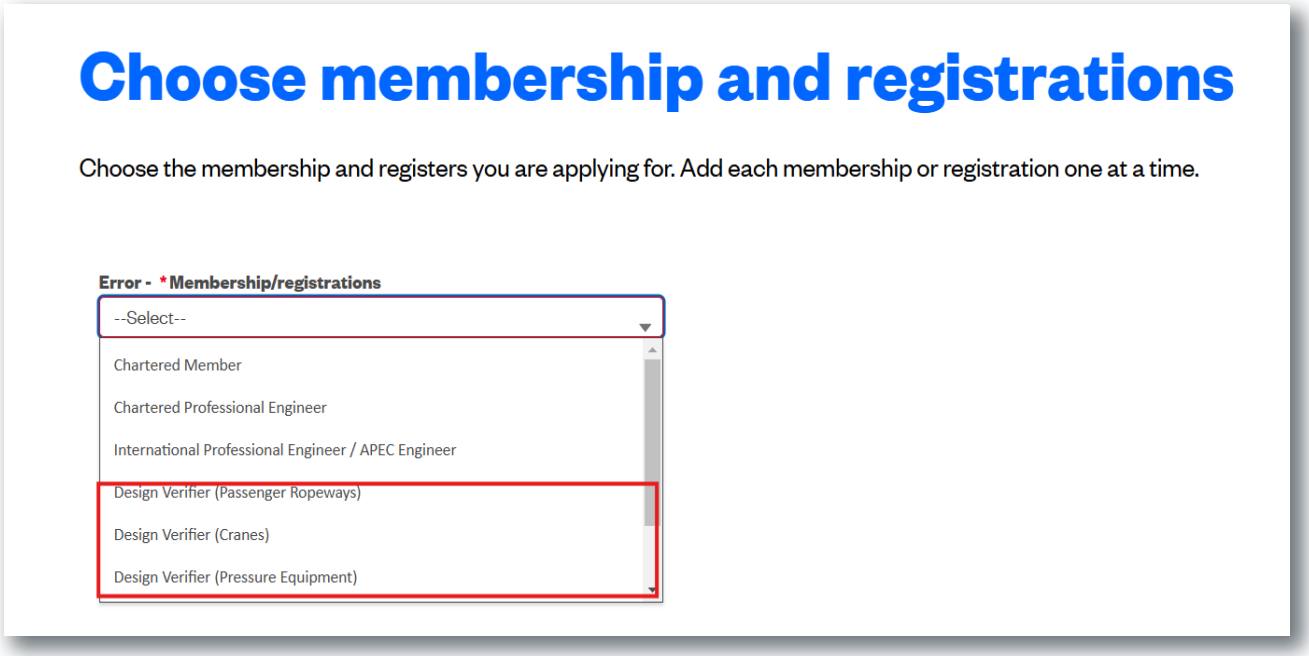
Applying if you are already registered as a CPEng

If you already registered as a Chartered Professional Engineer New Zealand (CPEng), you can apply to add registration as a Design Verifier to your current CPEng registration. Email assessment@engineeringnz.org and we will open an assessment for you. The assessment will require you to demonstrate your competence as a Design Verifier with a specific focus on CPEng Competency Group 1 (Engineering Knowledge) and Group 4 (Developing Technical Solutions). Please refer to Appendix 1 for details on Design Verifier performance indicators for these CPEng competency groups.

If this is your first time applying for CPEng

The CPEng assessment guidance should be your main point of reference when submitting a first-time application for CPEng. If you are including an application for Design Verifier in your first time CPEng assessment, please refer to Appendix 1 for details on Design Verifier performance indicators for each of the CPEng competency groups.

When completing your application, please indicate your intention to register as a Design Verifier in the 'Memberships and Registrations' section of the application. You'll be able to indicate whether you want to register for Passenger Ropeways, Cranes, Pressure Equipment, or a combination of these (note, if you want to apply for more than one category, you will need to add them one at a time):



Design Verifier application guidance

1. Referee guidance

You will need to nominate two referees in order to complete your application to register as a Design Verifier. Your nominated referees will be sent an invitation to provide a reference for you. If they accept the invitation, they'll be asked to provide information about your professionalism and technical competence as a Design Verifier. If a referee declines your request, you'll need to provide another person.

Both of your referees need to be a current Chartered Professional Engineer (CPEng), or equivalent. Both of your referees must be familiar with your technical and professional capabilities as a Design Verifier and be able to confidently provide a reference.

WHAT IS AN EXAMPLE OF A GOOD REFEREE?

Referees should be competent in the practice area that you are applying for. They should be familiar with your technical skills.

- ✓ Two referees should be provided.
- ✓ Ideally at least one of your referees does not work within the same company as you. This referee could be someone who has peer reviewed work samples or been involved in a collaborative project with you.
- ✗ A referee who is not familiar with your technical skills related to being a Design Verifier.
- ✗ Referees who are conflicted; for example, through a close personal relationship with you or having a financial interest in the outcome of the assessment.

Tip: Finding referees can be a particular challenge for people in small companies. We recommend you consider who may act as your referee well in advance of your application, and ensure this person has sufficient familiarity with your Design Verifier engineering work.

Referees will be asked the following questions

GENERAL

Please provide details of your relationship to the applicant. Please also confirm that you can provide a reference based on an understanding of the applicant's work within their practice area. If you're unable to provide a technical reference in the practice field of the applicant, please decline this request for a reference.

ENGINEERING COMPETENCY

Please comment on the technical engineering competence (specifically in analysis and design/problem solving) of the applicant to practice within their practice area. Do you consider the engineer to be competent in the engineering work that they do? Do you think they demonstrate knowledge and application of current practice in their field and an ability to develop safe and effective engineering solutions? Why or why not?

PROFESSIONAL

What aspects of professionalism do you believe the applicant brings to their work? Please include detail of their relationships with stakeholders, compliance with legislation, and health and safety compliance, where appropriate. Is there anything about the practice of the applicant that would raise a potential concern? Do you support their registration as a Chartered Professional Engineer/Recognised Engineer?

2. CPD guidance

Continued Professional Development (CPD) should be completed to show evidence that you have taken reasonable steps to maintain the currency of your Design Verifier engineering knowledge and skills since your last assessment/graduation/the past 6 years. You need to have done at least 40 hours of CPD per year over the past six years or since graduation, for their CPEng registration. A minimum of an additional 15 hours per year of Design Verifier specific CPD should be completed.

WHAT IS AN EXAMPLE OF GOOD CPD?

Active involvement in the industry is essential, and you will need to demonstrate that you have a high level of networking with other professional engineers working in in design verification.

- ✓ Evidence of learning linked to the application of contemporary knowledge of the activities of Design Verifiers.
- ✗ 15 hours of 'on the job reading'.
- ✗ 15 hours of 'mentoring'.

3. Work history guidance

Your work history must be provided in the form of an up-to-date CV and should allow an assessor to see your experience relevant to your application as a Design verifier.

WHAT IS AN EXAMPLE OF GOOD WORK HISTORY?

Your work history should describe the projects you have been involved with, and more importantly, your role in each project. It should outline what your responsibilities were for the project and what challenges were presented by the project.

Where possible, please keep your CV under three pages.

- ✓ Provide the name and location of employing organisations, as well as the dates and duration of employment, the title of your position, details of your role and how your work demonstrates your competency as a Design Verifier.
- ✓ Provide sufficient work history to demonstrate the broad scope of competency required for registration as a Design Verifier.
- ✓ Clearly describe key projects you were involved in, and your role in the work, with a particular focus on the period since your last assessment/since graduation/in the last 6 years.
- ✗ A list of projects you have worked on with no information on your roles and responsibilities.

4. Selecting and documenting your work samples

This part of your application is key to demonstrating your current technical competence as a Design Verifier. You'll be able to choose from your existing work and CPD records, or add new ones. For each record you choose, you'll need to explain how that record supports your assessment application. When you apply for registration as a Design Verifier, an assessor needs to confirm that the provided work samples clearly demonstrate competency in relation to the required core competencies for a Design Verifier.

You will need to provide sufficient evidence to demonstrate competence as a Design Verifier. For most candidates, this is two work samples. If evidence is missing, incomplete, or can't be clearly interpreted by an assessor, you'll be advised and further information requested.

APPLYING FOR THE FIRST TIME

If you are applying for initial assessment, you will be expected to provide an example of a design or design verification, you have personally completed, for each general type of equipment for which you are seeking to demonstrate competence. It is not normally necessary to submit an example of every possibility within each type, for example:

1. a pressure vessel, but not necessarily every subtype of pressure vessel (eg horizontal drum, column, heat exchanger, etc)
2. pressure piping, but not necessarily all subtypes (eg steam piping to ASME B31.1, ammonia refrigeration piping to B31.5, processing piping to B31.3, etc)
3. a boiler, but not necessarily all subtypes (shell and tube boiler, water tube boiler, etc)
4. a gantry crane, which subject to the opinion of the assessment panel, may be suitable to demonstrate competence for all of bridge, gantry, portal, jib cranes, and monorails.

You are not required to demonstrate competence with all types of equipment in any category, just the type(s) of equipment to be listed in your practice area description. For example, if the assessment panel considers you to be competent for design verification of gantry cranes, but not tower cranes or mobile cranes, then the agreed practice area description may be "Design Verification of Cranes (Gantry Cranes).

If you are applying for design verification of pressure equipment for all categories of pressure equipment (pressure vessels, boilers and pressure piping), at least one example of each category would need to be submitted.

CONTINUED REGISTRATION AS A DESIGN VERIFIER

A design verifier applying for continued registration is expected to provide sufficient examples of design or design verification work completed in the last 6 years to demonstrate continued competence. Normally an applicant for continued registration should submit at least one example for each category of equipment (eg Pressure Equipment, Crane or Passenger Ropeway). But would not normally be expected to supply examples for every subtype. For pressure equipment, the design verifier would normally be expected to provide an example for Pressure Piping, Pressure Vessel, and Boiler (as appropriate for the design verifiers area of practice).

DEFINING ACCEPTABLE WORK SAMPLES

Your work samples must clearly show that you understand the fundamentals of engineering as a Design Verifier. You are responsible for ensuring you have appropriate work samples to demonstrate your current competence.

Tips for success

- When writing up your submission, remember to talk about yourself using 'I', 'me' or 'my'. The assessors don't want to know what the team did as part of the project, they are only interested in your involvement.
- Record your work samples as you go – you don't want to have to go looking for work you did 4, 5 or 6 years ago.
- Exercise judgement and submit your best evidence, not everything you think might be relevant. The assessors will always come back to you if they find any gaps in your evidence and will give you the opportunity to provide further evidence. You should all be showing evidence of multiple competency groups and complexity in the majority of the projects that you are working on.
- Remember, it is up to you to demonstrate you are competent - not up to the assessors to interrogate you to ascertain your competency.

Appendix 1: Design Verifier competence assessment performance indicators

You'll need to demonstrate that you are able to practise competently as a Design Verifier, to the standard expected of a reasonable professional engineer. The extent to which you are able to perform each of the following numbered elements will be taken into account in assessing whether you meet the overall standard. You'll also need to show you can carry out engineering work at a particular level of complexity (see Appendix 2 for the definition of complexity as well as some examples of how you may be able to provide evidence of complexity for registration as a Design Verifier).

Each competency standard is described below, together with performance indicators which help clarify how you may be able to demonstrate that you have met the standard as a Design Verifier. Note that as these are indicators, you do not need to provide evidence on every indicator. The indicators are there as a guide, to assist you in providing types of work or evidence required of a Design Verifier to meet the element descriptions and build the holistic picture of a Design Verifier.

Assessment of Design Verifiers by the assessment panel is performed against the Engineering New Zealand competence criteria for Chartered Professional Engineer. Relevant key indicators of competence specifically for Design Verifiers are listed under the four groups below. Further guidance of a more general nature is contained in the CPEng assessment guidance.

Part 1 – Engineering knowledge

Competence standard description

a. Comprehend, and apply their knowledge of accepted principles underpinning:
   i. widely applied good practice for professional engineering; and
   ii. good practice for professional engineering that's specific to New Zealand.
b. Maintain the currency of their professional engineering knowledge and skills.

Design verifier performance indicators

» Able to select and apply appropriate load factors and factors of safety.
» Demonstrating understanding of principles behind requirements specified in equipment standards.
» In-depth understanding of relevant legislation, and the prescribed roles of various parties such as manufacturer, supplier, designer, design verifier, inspector.
» Understanding of different factors affecting the design life of equipment. For example – fatigue cycles, creep, corrosion allowance etc.
» Familiar with commonly used standards for the type of equipment.
» Familiarity with local requirements and local codes and standards, including those for earthquake and wind loading. Has knowledge and understanding of Engineering New Zealand Practice Note 19.
» Engineers are required to demonstrate experience with current standards. Engineers are not required to demonstrate competence with historic (superseded) standards.
» Aware of recent changes in relevant codes and standards.
» Applicants are is expected to demonstrate competency in the majority of codes and standards that are commonly used in New Zealand for the relevant type of equipment.
» A good knowledge regarding Fabrication and In-service inspection of the equipment.
» Relevant understanding of material selection (including low temperature), metallurgy, and corrosion.
» Appropriate understanding of fabrication techniques, such as welding, and appropriate quality control, non-destructive testing and inspection.
» Applicants shall provide evidence to demonstrate their knowledge on the aspects of the codes and regulations not covered by software reports.
» Design verifiers of pressure equipment are expected to meet the requirements of AS/NZS 4481:1997 Pressure equipment – Competencies of inspectors (section two – Competency of Design Verifiers), as well as this document and any additional requirements the assessment panel considers appropriate.

Part 2 – Managing engineering work

Competence standard description

- Exercise sound professional engineering judgement.
- Be responsible for making decisions on part or all of one or more complex engineering activities.
- Manage part or all of one or more complex engineering activities in accordance with good engineering management practice.
- Identify, assess, and manage engineering risk.

Design verifier performance indicators

- Plans, schedules, and organises design/design verification activities.
- Estimating time and cost, and tracking costs.
- Applies appropriate quality assurance techniques.
- Manages conflicting demands and expectations.
- Demonstrate effective self-management skills (including: undertaking professional development' setting own goals; practising effective time management; and recording professional development activities.
- Active participation in quality system continuous improvement activities, such as quality audits and or peer reviews.
- Seeks and incorporates feed-back from stakeholders (such as clients) and peers.
- Evidence of hazard level identification (such as applying AS4343) and selecting appropriate level of design verification and inspection requirements.

Part 3 – Professional acumen

Competence standard description

- Conduct their professional engineering activities to an ethical standard at least equivalent to the Code of Ethical Conduct.
- Recognise the reasonably foreseeable social, cultural, and environmental effects of professional engineering activities generally.
- Communicate clearly to other engineers and others they are likely to deal with in the course of their professional engineering activities.

Performance indicators

- Demonstrate understanding of significance of design verification actives, and able to identify potential stakeholders effected by design verification activities.
- Awareness of potential life safety risks, social, cultural, and environmental impacts related to design verification.
- Evidence of effective professional communication.
- Evidence of exercising judgement on own competence – outline actions taken when confronted with work outside own area of competence.
- Awareness of potential risks to impartiality and appropriate mitigation measures. How does the applicant deal with potential conflicts of interest?
- Applicant's plan to deal with undue pressure from employer, clients or other stakeholder.
- Dealing with situations where requirements of codes, standards or regulations are unclear or vague.
- Dealing with non-compliances in existing equipment where equipment is being modified.
- When dealing with unfamiliar or new areas, seeks appropriate guidance, and utilises a variety of appropriate resources such as codes/standards, textbooks and reputable technical journals.

Part 4 – Developing technical solutions

Competence standard description

- Define, investigate, and analyse complex engineering problems in accordance with good practice for professional engineering.
- Design or develop solutions to complex engineering problems in accordance with good practice for professional engineering.

Design verifier performance indicators

- Evidence demonstrates knowledge of technical fundamentals (including initial specification and brief in terms of client perceptions, use of engineering design standards and specifications) to scope a complex engineering problem.
- Examples of methodologies used for analysis, prediction, and choice outside those encompassed by standard codes (including preparing functional design requirements, addressing design concepts, and determining possible design constraints).
- Evidence of literature searches, use of network of peers to gather information on approaches to problem solving.
- Demonstrates use and understanding of appropriate analysis techniques, for example:
  - (for pressure piping) Use of piping stress analysis software, and understanding of underlying principles such as flexibility factors and stress intensity factors
  - (for pressure vessels) calculation of stress due to internal and external pressure using hand calculations, understanding of calculation methods for loads on supports and nozzles and limitations of various methods.
  - (for cranes) Strength of materials and structural code calculations and use of structural analysis software.
- Evidence of performing design verification in a systematic manner, including developing and utilising checklists.
- Performance of fatigue calculations.
- Performance of weld sizing calculations.
- Sizing calculations for bolted joints, including flanges and base-plates.
- Able to calculate forces & moments, deflections, and stresses & strains using widely accepted conventional methods such as strength of materials.
- Calculation of local stresses, and assessing suitability of these using widely accepted best practice.
- Can perform appropriate material selection, including consideration of strength, deflection, high and low temperature, wear and fatigue.
- Applies appropriate analysis techniques. Reports from commonly available analysis software are acceptable but having done the hand /manual calculations for results verification would be an added advantage. Where manual calculations are not available, applicant should provide additional supporting material and notes to demonstrate their knowledge on the code calculations performed by the software.
- Applicant should be able to demonstrate basic checks of results from computer analysis (such as reactions forces and moments at constraints, and nominal stress in members).
- Applicant shall expect the panel to ask in-depth technical questions regarding the work samples provided and questions from any areas not covered in the application but deemed important by panel.
- How does the applicant maintain their technical competency?
- CPD records must contain activities relevant to categories and equipment types with design verifiers area of practice.

For pressure equipment:

- able to calculate and check pressure relief requirements
- uses appropriate techniques to consider loads on equipment nozzles
- demonstrates a thorough understanding of the Stress Categories as described in, Annex A of PD 5500 or Appendix H of AS 1210 or ASME VIII Div 2 Part 5 (as these concepts for the basis of many modern pressure vessel and piping code rules).
- uses appropriate techniques for analysing equipment supports
- understanding of finite element analysis (FEA), and sufficient knowledge and experience to interpret FEA results in accordance with relevant codes and standards.

For Cranes:

- Calculations of inertia accelerations for side loads, and skew loads
- Calculations showing impact factor, duty factor, dynamic factors
- Localised transverse stresses in main beam from trolley wheel loads
- Stability calculations
- Crane wheel calculations, including wheel shafts
- Crane member calculations (eg main beam and end carriages for overhead traveling cranes).

Appendix 2: How we define complexity

You'll need to show you can carry out engineering work at a particular level of complexity.

Problem	Activity
Chartered Member and CPEng	
Complex engineering problems Problems that include some or all of the following: » Wide-ranging or conflicting technical, engineering, and other related issues » No obvious solution, which means an original method of analysis is needed » Can't be resolved without in-depth engineering knowledge » Issues not often experienced » Aren't covered by the standards and codes of practice for professional engineering » Diverse groups of stakeholders with a wide range of needs » Significant consequences in a range of contexts.	**Complex engineering activities** Activities or projects that include some or all of the following: » Diverse resources, eg people, money, equipment, aterials and technologies » Resolving critical problems that occur when a variety of technical, engineering and other related issues interact » New materials, techniques or processes, or the innovative use of existing materials, techniques, or processes » Significant consequences in a range of contexts.

Here are some examples of how design verifiers may provide evidence of complexity at a CPEng level:

» Interpretation of the requirements of codes and standards for equipment, where the application of these is not straightforward (such as fatigue assessment or design by analysis).

» Calculations performed from first principles where standard methods in handbooks or codes/standards have not been appropriate.

» Resolving a critical problem, which involved a range of stakeholders such as Owners/Client, Designer, Pressure Equipment Inspectors, WorkSafe NZ.

» Providing Input into national regulation or guidance documents for equipment.

REGISTRATION AUTHORITY
FOR CHARTERED PROFESSIONAL ENGINEERS

engineering new zealand
te ao rangahau

L6, 40 Taranaki St
Wellington 6011
assessment@engineeringnz.org
www.registrationauthority.co.nz

The Registration Authority under the Chartered Professional Engineers of New Zealand Act 2002 is the Institution of Professional Engineers New Zealand (trading as Engineering New Zealand).