



IPENZ COMPETENCE STANDARD FOR PROFESSIONAL ENGINEERS (INCLUDING PERFORMANCE INDICATORS)

The following competence standard sets the entry standard for engineers seeking formal peer recognition as a competent professional engineer by undertaking an IPENZ competence assessment. The competence standard below sets the standard for *Initial Registration as a Chartered Professional Engineer (CPEng)*, and the standard for entry into the class of *Professional Member with IPENZ ENGINEERS NEW ZEALAND* and informs entry into the *International Register for Professional Engineers (IntPE)*.

What is a Competence standard?

A competence standard is an indication of an expected level of performance. The competence assessments conducted by IPENZ require applicants to provide sufficient evidence to demonstrate they are able to consistently apply knowledge, understanding and skills to the standard expected of a reasonable professional engineer.

Chartered Professional Engineer Act 2002

The Chartered Professional Engineers of New Zealand Rules (No 2) 2002 and amendments specify the minimum standard for registration, and this document summarises the standard.

Format of IPENZ Competence Standard for Professional Engineers

This document contains the standard and associated material.

12 elements: these represent broad areas of professional engineering performance. Taken holistically, these elements make up the minimum standard for registration as outlined in the CPEng Rules.

performance indicators (bullet points): these provide further detail as to the meaning of each element thereby enabling the applicant and assessors to have a clearer understanding of the performance required to demonstrate competency in each element. They are important indicators of competence but are not criteria that need to be met nor are they an exhaustive list.

definition: these provide a critical component of the standard and need to be considered carefully by applicants when they are preparing their portfolio of evidence to demonstrate they meet the competence standard.

Performance assessed against each Element

Those undertaking an assessment with IPENZ are expected to provide to their Assessment Panel evidence of their current competence which demonstrates that they are able to meet all the *elements* of the standard. The Panel, however, considers the totality of the evidence supplied and makes an *holistic* assessment as to whether each applicant meets the IPENZ Competence Standard for Professional Engineers.

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To meet the minimum standard a person must demonstrate that he/she is able to practice competently in his/her practice area to the standard expected of a reasonable professional engineer.

The extent to which the person is able to perform each of the following numbered elements in his/her practice area must be taken into account in assessing whether or not he/she meets the overall standard.

1 Comprehend, and apply knowledge of, accepted principles underpinning widely applied good practice for professional engineering

- Has a Washington Accord degree or recognised equivalent qualification or has demonstrated equivalent knowledge and is able to:
- Identify, comprehend and apply appropriate engineering knowledge
- Work from first principles to make reliable predictions of outcomes
- Seek advice, where necessary, to supplement own knowledge and experience
- Read literature, comprehend, evaluate and apply new knowledge

2 Comprehend, and apply knowledge of, accepted principles underpinning good practice for professional engineering that is specific to the jurisdiction in which he/she practices (For CPEng assessment this relates to the jurisdiction of NZ)

- Demonstrates an awareness of legal requirements and regulatory issues within the jurisdictions in which he/she practices
- Demonstrates an awareness of and applies appropriately the special engineering requirements operating within the jurisdictions in which he/she practices

3 Define, investigate and analyse *complex engineering problems* in accordance with good practice for professional engineering

- Identifies and defines the scope of the problem
- Investigates and analyses relevant information using quantitative and qualitative techniques
- Tests analysis for correctness of results
- Conducts any necessary research and reaches substantiated conclusions

4 Design or develop solutions to *complex engineering problems* in accordance with good practice for professional engineering.

- Identifies needs, requirements, constraints and performance criteria
- Develops concepts and recommendations that were tested against engineering principles
- Consults with stakeholders

- Evaluates options and selects solution that best matched needs, requirements and criteria
 - Plans and implements effective, efficient and practical systems or solutions
 - Evaluates outcomes
- 5 Be responsible for making decisions on part or all of one or more *complex engineering activities***
- Takes accountability for his/her outputs and for those for whom he/she is responsible
 - Accepts responsibility for his/her engineering activities
- 6 Manage part or all of one or more *complex engineering activities* in accordance with good engineering management practice**
- Plans, schedules and organises projects to deliver specified outcomes
 - Applies appropriate quality assurance techniques
 - Manages resources, including personnel, finance and physical resources
 - Manages conflicting demands and expectations
- 7 Identify, assess and manage engineering risk**
- Identifies risks
 - Develops risk management policies, procedures and protocols to manage safety and hazards
 - Manages risks through 'elimination, minimisation and avoidance' techniques
- 8 Conduct engineering activities to an ethical standard at least equivalent to the relevant code of ethical conduct**
- Demonstrates understanding of IPENZ and/or CPEng codes of ethics
 - Behaves in accordance with the relevant code of ethics even in difficult circumstances (includes demonstrating an awareness of limits of capability; acting with integrity and honesty and demonstrating self management)
- 9 Recognise the reasonably foreseeable social, cultural and environmental effects of professional engineering activities generally**
- Considers and, where needed, takes into account health and safety compliance issues and impact(s) on those affected by engineering activities
 - Considers and takes into account possible social, cultural and environmental impacts and consults where appropriate
 - Considers Treaty of Waitangi implications and consults accordingly
 - Recognises impact and long-term effects of engineering activities on the environment
 - Recognises foreseeable effects and where practicable seeks to reduce adverse effects

10 Communicate clearly with other engineers and others that he or she is likely to deal with in the course of his or her professional engineering activities

- Uses oral and written communication to meet the needs and expectations of his/her audience
- Communicates using a range of media suitable to the audience and context
- Treats people with respect
- Develops empathy and uses active listening skills when communicating with others
- Operates effectively as a team member

11 Maintain the currency of his or her professional engineering knowledge and skills

- Demonstrates a commitment to extending and developing knowledge and skills
- Participates in education, training, mentoring or other programmes contributing to his/her professional development
- Adapts and updates knowledge base in the course of professional practice
- Demonstrates collaborative involvement with professional engineers (NZ engineers for CPEng assessments)

12 Exercise sound professional engineering judgement

- Demonstrates the ability to identify alternative options
- Demonstrates the ability to choose between options and justify decisions
- Peers recognise his/her ability to exercise sound professional engineering judgement

Definitions:

i Practice Area

Quoting the CPEng Rules:

practice area means an engineer's area of practice, as determined by—

- (a) the area within which he or she has engineering knowledge and skills;
- and
- (b) the nature of his or her professional engineering activities.

The **practice area** is a combination of both the area in which the engineer holds specialised engineering knowledge and the nature of the activities performed, and one or both of these may change over the course of professional life. The competence of the applicant will be assessed in his/her **current** area of engineering practice.

ii Complex engineering activities

Complex engineering activities means engineering activities or projects that have some or all of the following characteristics:

Involve the use of diverse resources (and, for this purpose, **resources** includes people, money, equipment, materials and technologies);

Require resolution of critical problems arising from interactions between wide ranging technical, engineering and other issues;

Have significant consequences in a range of contexts;

Involve the use of new materials, techniques, or processes or the use of existing materials, techniques, or processes in innovative ways.

iii Complex engineering problems

Complex engineering problems have some or all of the following characteristics:

- Involve wide-ranging or conflicting technical, engineering, and other issues;
- Have no obvious solution and require originality in analysis;
- Involve infrequently encountered issues;
- Are outside problems encompassed by standards and codes of practice for professional engineering;
- Involve diverse groups of stakeholders with widely varying needs;
- Have significant consequences in a range of contexts;
- Cannot be resolved without in-depth engineering knowledge.

iv Knowledge Specific to Local Jurisdictions

Applicants will need to provide evidence that, within the jurisdictions in which they work, they:

- (a) Understand the general principles behind applicable codes of practice;
- (b) Have demonstrated a capacity to ensure such principles are applied safely and efficiently; and
- (c) Are aware of the special requirements operating within the host jurisdiction.

v Methods of Analysis

The techniques used in quantitative analysis will vary depending on the field of engineering practice however they include computer, mathematical or reliability modelling, statistics, and the use of planning tools.

vi Design and Development

Design and development are a conceptual processes used to bring together innovation, aesthetics and functionality to plan and create an artefact, product, process, component or system to solve a complex engineering problem. The design or development process may develop the shape, size and selection of material and components for engineering products/outcomes.

Design and development also include engineering planning, an example of which is the process of locating facilities and items of engineering construction taking into account all the factors affecting their relationship and their inter-relationships with the external environment.

vii Responsibility for Making Decisions for Complex Engineering Activities

Applicants may be taken to have been **responsible for making decisions for complex engineering activities** when they have:

- Planned, designed, co-ordinated and executed a (small) project; or
- Undertaken part of a larger project based on an understanding of the whole project;
- Or undertaken novel, complex or multi-disciplinary work.