Engineering Edge

choosing the right engineer

a reference guide

IPENZ
ENGINEERS NEW ZEALAND

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Using This Guide – Getting the Right Engineer for the Job

This guide is a brief introduction to the wider engineering profession and its credentialing framework, to help ensure that the right engineer is chosen for every job. It is aimed at regulators, purchasers of engineering services, employers of engineers and engineers themselves.

Engineering is involved in every aspect of human life – food and accommodation, transportation and infrastructure, medicine, communication, and entertainment to name a few.

The national body representing the engineering profession is the Institution of Professional Engineers New Zealand (IPENZ). IPENZ sets and enforces competence and ethical standards for the profession, in line with international best practice.

IPENZ is the Registration Authority under the Chartered Professional Engineers of New Zealand Act 2002 (the Act). The Chartered Professional Engineer (CPEng) register is the only statutory-backed register of current competence for engineers in New Zealand. Other registers referenced in this guide are administered under IPENZ regulations.

A Chartered Professional Engineers Council exists as a statutory body to hear complaints and ensure the Registration Authority operates in accordance with the Act.

Members of the wider engineering profession work at various levels of expertise and exercise different degrees of direct responsibility – some jobs are small and routine, others are worth millions of dollars and affect the safety of thousands of people.

There are three engineering occupational groups within the wider engineering profession: professional engineers, engineering technologists and engineering technicians. Within any strong engineering team, it is likely that each occupational group will be well represented. Before specifying or employing engineering expertise, it is important to assess the nature of the work.

- For work characterised as complex engineering (refer to page 11 for a definition) use a professional engineer.
- For work characterised as broadly-defined engineering (refer to page 15 for a definition) use an engineering technologist.
- For work characterised as well-defined engineering (refer to page 19 for a definition) use an engineering technician.

A general summary of the key attributes of each occupational group is provided in the table on pages 4–5. More detailed descriptions, and copies of the internationally benchmarked competence

standards and definitions for each group, can be found on pages 6–19. This section also explains the broad relationships between academic qualifications and occupational groupings and helps interpret the postnominals (or letters) after an engineer's name.

Registration on a relevant current competence register provides employers, regulators and purchasers of engineering services with an independent assessment of the engineer's current competence to do engineering work at a particular level of complexity.

Members of IPENZ enjoy professional standing, that is, the respect of their peers. This provides further assurance about the likely quality of engineering services that they provide.

IPENZ Members and engineers on current competence registers are bound by a code of ethics and subject to independent complaints and disciplinary processes.

The career model on page 36 shows how engineers may move between the three occupational groups by deepening their technical knowledge and/or move into team leadership or management roles. The relevance of IPENZ current competence registers and Membership classes at different career stages is also described.

Specific guidelines for regulators, purchasers of engineering services and employers of engineers (or their agents) can be found on pages 29–31.

		Engineering Role
		Professional Engineer Capable of dealing with complex engineering problems and activities
QUALITY MARKS	**National Current Competence Register** Registrants are reassessed every five years	**Chartered Professional Engineer (CPEng)** Chartered Professional Engineers Act 2002 created the only statutory-backed register for professional engineers in New Zealand
	International Register Recognising competent practitioners internationally	**International Professional Engineer (IntPE)**
	Related Multilateral Agreement(s) Support international mobility and provide benchmarks for professional competence assessment standards	Engineers Mobility Forum APEC Engineer
QUALIFICATIONS	**Membership Class** Marks of standing and engagement with the New Zealand engineering profession	**Professional Member (MIPENZ)**
		Fellow (FIPENZ) Recognition of substantial contribution to the engineering profession, engineering practice or IPENZ
	Exemplifying Qualification Typical New Zealand qualification for entry to occupational group	**Four-year Bachelor of Engineering**
	Related Multilateral Agreement Provides international recognition of IPENZ-accredited engineering qualifications and benchmarking of New Zealand engineering education standards	Washington Accord

Engineering Technologist Capable of dealing with broadly-defined engineering problems and activities	**Engineering Technician** Capable of dealing with well-defined engineering problems and activities
Engineering Technology Practitioner (ETPract)	**Certified Engineering Technician (CertETn)**
International Engineering Technologist (IntET)	
Engineering Technologist Mobility Forum	
Technical Member (TIPENZ)	**Associate Member (AIPENZ)**
Three-year Bachelor of Engineering Technology	**Two-year Diploma of Engineering**
Sydney Accord	Dublin Accord

Professional Engineers

Professional engineers work in areas requiring specialist engineering knowledge – analysing, solving and managing complex engineering problems. They take responsibility for the largest engineering projects, sometimes worth hundreds of millions of dollars. Most professional engineers hold four-year Bachelor of Engineering (BE) degrees.

Professional engineers are required to take far-reaching responsibility for engineering projects and programmes, including the reliability of materials and technologies, their integration into effective systems, and the interaction between the technical systems and their environments.

A professional engineer's work involves understanding the requirements of clients and of society as a whole; working to optimise social, environmental and economic outcomes over the lifetime of the product or project; interacting effectively with the other disciplines, professions and people involved; and ensuring that the engineering contribution is properly integrated into the whole.

They are also responsible for interpreting technological possibilities for society, business and government, helping ensure that policy decisions recognise such possibilities, and that costs, risks, limitations and probable outcomes are properly understood.

The work of professional engineers is mainly intellectual. They are concerned with advancing technologies and applying them creatively and innovatively. They may work in researching and developing new engineering principles and technologies, advancing the practice of engineering, or devising or updating its governing codes and standards.

Professional engineers have a particular responsibility for ensuring that projects are soundly based in fundamental principles, and for understanding how new developments relate to established practice. A hallmark of a professional engineer is the ability to break new ground in a responsible way.

Professional engineers take a disciplined, holistic approach to complex engineering. They must be able to offer alternatives, defining their risks and benefits, and use professional judgement to choose the optimum workable approach. They must be able to recognise, assess and manage risks to clients, users, the community and the environment.

Current Competence in Professional Engineering

CPEng – Chartered Professional Engineer

Chartered Professional Engineer (CPEng) is the only statutory-backed quality mark for professional engineers in New Zealand, and attests to the current competence of a professional engineer to practice in New Zealand. The CPEng register was established under the Chartered Professional Engineers of New Zealand Act 2002, which appointed IPENZ as the Registration Authority.

The Act reflects the view of government that occupational standards in New Zealand, and associated public registers, should be developed within a current competence framework. Engineers on the CPEng register are required to undergo periodic review to demonstrate their current competence.

In New Zealand the title CPEng can be used only by engineers on the CPEng register. The CPEng register includes the date at which each registrant's next competence assessment is due, and is available at all times to the public at www.ipenz.org.nz/finding/cpeng

Each CPEng registrant knows the types of work for which his or her engineering skills and knowledge are up to date. This is called his or her practice area.

Each registrant is assessed for competence in their own current practice area. The CPEng Code of Ethical Conduct requires that Chartered Professional Engineers work only within their competence – they must refuse to undertake any proposed work that lies outside this and when undertaking work can be asked to declare in writing that they are competent to perform the task.

Some regulatory authorities specify that certain kinds of work must be carried out or supervised by Chartered Professional Engineers – for example, inspections of amusement devices through the Department of Labour, and certain types of design work submitted under the Building Act for a building consent.

The Chartered Professional Engineers of New Zealand Act 2002 can be viewed at www.ipenz.org.nz/ipenz/forms/pdfs/cpengact.pdf

IntPE(NZ) – International Register of Professional Engineers

The International Register of Professional Engineers recognises competent professional engineers internationally. IntPE registration signals that an engineer meets an international standard of

competence, agreed and recognised by signatories to the Engineers Mobility Forum (EMF) and APEC Engineer Agreement. The registering jurisdiction is shown in parentheses after "IntPE" in the postnominal, for example, IntPE(NZ). The requirements for IntPE registration are very similar to those for CPEng, but are more prescribed regarding educational qualifications (which must be on an approved list), time spent in responsible engineering management, and experience after graduation.

To remain on the New Zealand section of the IntPE register, an engineer must demonstrate current competence every five years, just as they do for CPEng. Other countries require registrants on their sections of the International Register to demonstrate a specified amount of participation in continuing professional development, but their resultant competence is not regularly assessed. In this respect the New Zealand requirements are more stringent.

Some countries that are signatories to the APEC Engineer agreement, particularly in Asia, operate a separate APEC Engineer Register and refer to registrants as APEC Engineers. IntPE(NZ) registrants are also APEC Engineers and may find this terminology useful, particularly if practising in Asia.

Current signatories to the EMF and APEC Engineer agreements, and links to registers of engineers registered in each jurisdiction, can be found at www.ieagreements.org

Related Quality Marks for Professional Engineers

IPENZ administers the following quality marks, which have CPEng registration as a corequisite, that signify current competence to undertake prescribed types of professional engineering work.

- Recognised Engineer – dam classification or dam safety auditing under the Building Act
- Design Verifier – design of pressure equipment, cranes and passenger ropeways under Occupational Safety and Health regulations.

Engineers with these quality marks have demonstrated competence against the competence standard for professional engineers in a practice area that covers the expectations of the related quality mark.

Professional Standing in the Engineering Community

MIPENZ – Professional Membership of IPENZ

Professional engineers are able to progress to Professional Membership of IPENZ (MIPENZ). Professional Members have demonstrated competence against the professional engineer's competence standard at some stage in their careers. Professional Members of IPENZ are in good professional standing amongst their peers. While CPEng registration is the primary way consumers can be assured about the engineer they select, good professional standing adds a secondary level of assurance.

Members are engaged in continuing professional development, and support the development and sharing of engineering knowledge, good practice and standards. Members are bound by a code of ethics, professional development expectations and disciplinary processes.

IPENZ Practice College

The Practice College identifies those practitioners best suited to provide guidance to the governing Board of IPENZ on engineering practice issues. Professional Members of IPENZ are elected as Professional Members of the IPENZ Practice College if they have demonstrated current competence in the last five years. This is usually done by gaining CPEng registration.

Fellowship (FIPENZ, DistFIPENZ or HonFIPENZ)

Fellowship of IPENZ recognises engineers who have made a substantial contribution to the engineering profession, engineering practice or IPENZ. Fellowship is an honour offered to less then ten per cent of competence-graded Members.

Qualifications for Professional Engineers

Most professional engineers educated in New Zealand have four-year Bachelor of Engineering (BE) degrees. These qualifications are offered by several tertiary education organisations, and can be accredited by IPENZ as meeting an international standard under the Washington Accord, a multilateral agreement that provides international recognition of New Zealand engineering graduates and benchmarking of qualification standards. A list of IPENZ-accredited four-year engineering degrees is available at www.ipenz.org.nz/ipenz/education_career/accreditation

The competencies expected of a graduate are described on pages 32–33.

Holders of a recognised professional engineering qualification are eligible for Graduate Membership of IPENZ (GIPENZ). Like other IPENZ Members, Graduate Members demonstrate a level of support for, and engagement with, the engineering profession in New Zealand and are bound by a code of ethics.

Competence Standard for Professional Engineers

To be recognised as competent professional engineers, engineers must demonstrate that, within their practice areas, they can:

- comprehend and apply the accepted principles underpinning good practice in professional engineering
- comprehend and apply the accepted principles of good practice[1] specific to the jurisdiction in which they practise
- define, investigate and analyse complex engineering problems in accordance with good practice for professional engineers
- design or develop solutions to complex engineering problems in accordance with good practice for professional engineers
- be responsible for making decisions on complex engineering activities
- manage complex engineering activities in accordance with good engineering management practice
- identify, assess and manage engineering risk
- conduct complex engineering activities to a relevant ethical standard
- recognise the reasonably foreseeable social, cultural and environmental effects of their activities
- communicate clearly with other engineers and others in the course of their professional engineering activities
- maintain the currency of their professional engineering knowledge and skills
- exercise sound professional engineering judgement.

In their periodic (five-yearly) review, Chartered Professional Engineers must demonstrate that they:

- are still able to practise competently to the standard of a professional engineer
- have taken reasonable steps to maintain competence.

The practice area of a professional engineer is defined by both the area in which the engineer holds engineering knowledge and the nature of the engineering activities performed.

[1] *The CPEng registration standard states that engineers need to be able to comprehend and apply the accepted principles underpinning good practice specific to New Zealand.*

*Complex*engineering:

Complex engineering problems cannot be resolved without in-depth engineering knowledge, and they have some or all of the following characteristics:

- involve wide-ranging or conflicting technical, engineering and other issues
- have no obvious solution and require original analysis
- require a first-principles, fundamentals-based analytical approach
- involve infrequently encountered issues
- are outside the compass of standards and codes of practice
- involve diverse groups of stakeholders with widely varying needs
- have significant consequences in various contexts
- include many component parts or sub-problems.

Complex engineering activities or projects exhibit some or all of the following characteristics:

- involve using knowledge of engineering principles in creative ways
- require the resolution of significant problems arising from interactions between wide-ranging or conflicting technical or other issues
- have significant consequences in various contexts
- involve the use of diverse resources (such as people, money, equipment, materials and technologies)
- can extend beyond previous experience by applying principles-based approaches.

*Sample*credentials

Joe Bloggs CPEng, MIPENZ, IntPE(NZ), BE(Hons)

1. *Joe is a Chartered Professional Engineer: he currently meets the statutory New Zealand competence standard for professional engineers – CPEng.*
2. *Joe is a Professional Member of IPENZ: a mark of professional standing and adherence to a strict ethical code – MIPENZ.*
3. *Joe currently meets the international competence standard for professional engineers – IntPE(NZ).*
4. *Joe holds an honours degree in engineering (the discipline should not be included unless it represents his current practice field) – BE(Hons).*

If Joe was also CPEng from Australia and CEng from the United Kingdom, he would write:

Joe Bloggs CPEng, MIPENZ, IntPE(NZ), CPEng(Aust), CEng(UK), BE(Hons)

Or, to have a truly international business card, he might prefer:

Joe Bloggs CPEng(NZ), MIPENZ, IntPE(NZ), CPEng(Aust), CEng(UK), BE(Hons)

Engineering Technologists

Engineering technologists apply analytical skills and knowledge of technological principles and physical processes to solve broadly-defined engineering problems. A three-year Bachelor of Engineering Technology (BEngTech) degree from a university, institute of technology or polytechnic is the underpinning qualification for engineering technologists in New Zealand.

Engineering technologists' work usually involves applying current and emerging technologies, often in new contexts, or applying established principles in the development of new practice. They may also contribute to the advancement of particular technologies. Engineering technologists require a deep knowledge of practical situations and applications, a strong grasp of scientific and engineering principles, and a well-developed capacity for analysis. They must keep abreast of developments in their particular fields.

They are typically specialists in particular fields of engineering technology. Within their specialisations, their expertise may be equivalent to that of a professional engineer, but they are not expected to take such a broad perspective, or carry such extensive responsibility for dealing with stakeholders, integrating systems, or synthesising approaches to complex engineering problems. Technologists often work as contributing designers or technical trouble-shooters.

Engineering technologists are equipped to approve or certify technical operations such as calibration and testing regimes, compliance with performance-based criteria for safety, and the design of components and sub-systems of installations such as building services where significant new development is not involved. Such certification from engineering technologists should be acceptable without further verification by others.

Current Competence in Engineering Technology

ETPract – Engineering Technology Practitioner

Engineering Technology Practitioner is a register of currently competent engineering technologists that is administered by IPENZ. Registration is gained by demonstrating competence against the competence standard for engineering technologists, which is internationally benchmarked. Current competence must be demonstrated through a reassessment at no more than five-yearly intervals.

Engineering Technology Practitioners are assessed in their own current practice area (the area in which their engineering skills and knowledge are up to date) and are bound by a code of ethics, which requires that they only work within their area of competence. When undertaking work they can be asked to declare in writing that they are competent to perform the task.

IntET(NZ) – International Engineering Technologist

This register was opened in July 2007 to recognise engineering technologists internationally. Registered International Engineering Technologists have demonstrated that they have met an international standard agreed to and recognised by signatories to the Engineering Technologist Mobility Forum (ETMF).

The requirements for IntET registration are similar to those for ETPract, but as with IntPE, specific requirements apply relating to qualifications, experience and time in responsible charge.

Current signatories to the ETMF and links to registers of engineering technologists in each jurisdiction can be found at www.ieagreements.org

Professional Standing in the Engineering Community

TIPENZ – Technical Membership of IPENZ

Engineering technologists are able to progress to Technical Membership of IPENZ (TIPENZ). Technical Members have demonstrated competence against the competence standard for engineering technologists at some stage in their careers and are in good professional standing amongst their peers.

IPENZ Members are engaged in continuing professional development, and support the development and sharing of engineering knowledge, good practice and standards. Members are bound by a code of ethics, professional development expectations and disciplinary processes.

IPENZ Practice College

The Practice College identifies those practitioners best suited to provide guidance to the governing Board of IPENZ on engineering technology practice issues. Technical Members of IPENZ are elected as Technical Members of the IPENZ Practice College if they have demonstrated current competence in the last five years. This is usually done by gaining ETPract registration.

Qualifications for Engineering Technologists

The three-year Bachelor of Engineering Technology (BEngTech) is the standard qualification for engineering technologists. IPENZ accredits these degrees in line with the international standard set by the Sydney Accord. A list of IPENZ-accredited three-year engineering degrees can be found at www.ipenz.org.nz/ipenz/education_career/accreditation

The competencies expected of graduates are described on pages 32–33.

Holders of a recognised engineering technology qualification are eligible for Graduate Membership of IPENZ (GIPENZ). Like other IPENZ Members, Graduate Members demonstrate a level of support for, and engagement with, the engineering profession in New Zealand and are bound by a code of ethics.

Competence Standard for Engineering Technologists

To be recognised as competent engineering technologists, engineers must demonstrate that, within their practice areas, they can:

- comprehend and apply knowledge underpinning good practice as an engineering technology practitioner (Sydney Accord degree level)
- comprehend and apply knowledge underpinning good practice as an engineering technology practitioner that is specific to the jurisdiction in which they practise
- identify, clarify and analyse broadly-defined engineering problems in accordance with good engineering practice
- design or develop solutions to broadly-defined engineering problems by applying accepted procedures or methodologies
- be responsible for making decisions on part or all of one or more broadly-defined engineering activities
- manage part or all of one or more broadly-defined engineering activities in accordance with good engineering management practice
- identify risks and apply risk management techniques to broadly-defined engineering activities
- conduct engineering activities to an ethical standard at least equivalent to the relevant code of ethical conduct
- recognise the reasonably foreseeable social, cultural and environmental effects of broadly-defined engineering activities
- communicate clearly with others in the course of broadly-defined engineering activities
- maintain the currency of their engineering knowledge and skills
- exercise sound engineering judgement

The practice area of an engineering technologist is defined by both the area in which they have engineering knowledge and the nature of the engineering activities they perform.

Broadly-defined engineering:

Broadly-defined engineering problems have some or all of the following characteristics:

- can be solved by applying well-proven analysis techniques
- require knowledge of principles and applied procedures or methodologies
- are parts of, or systems within, complex engineering functions
- belong to families of familiar problems which are solved in well-accepted ways
- may be partially outside the scope of standards or codes of practice
- involve multiple stakeholders whose needs may differ
- involve a variety of factors, which may impose conflicting constraints
- have consequences which are important locally and sometimes more widely.

Broadly-defined engineering activities exhibit some or all of the following characteristics:

- involve a variety of resources (such as people, money, equipment, materials, information and technology)
- require occasional resolution of interactions between technical, engineering and other issues, a few of which are conflicting
- involve the use of new materials, processes or techniques in innovative ways
- have consequences of mostly local, but sometimes wider, importance
- require knowledge of normal operating procedures and processes.

Sample credentials

Joanna Bloggs ETPract, TIPENZ, IntET(NZ), BEngTech

1. *Joanna is registered as an Engineering Technology Practitioner: she currently meets the IPENZ competence standard for engineering technologists – ETPract.*
2. *Joanna is a Technical Member of IPENZ: a mark of professional standing and adherence to a strict ethical code – TIPENZ.*
3. *Joanna currently meets the international competence standard for engineering technologists – IntET(NZ).*
4. *Joanna holds an engineering technology degree (the discipline should not be included unless it represents her current practice field) – BEngTech.*

If Joanna was also IEng (the United Kingdom equivalent of ETPract), she would write:

Joanna Bloggs ETPract, TIPENZ, IntET(NZ), IEng(UK), BEngTech

Or, to have truly international business cards, she might prefer:

Joanna Bloggs ETPract(NZ), TIPENZ, IntET(NZ), IEng(UK), BEngTech

Engineering Technicians

Engineering technicians solve well-defined engineering problems by applying practical know-how and established analytical techniques and procedures. Many engineering technicians hold a two-year Diploma of Engineering (DipE) from an Institute of Technology or polytechnic, or its predecessor, the New Zealand Certificate in Engineering (NZCE).

Engineering technicians focus on practical applications. They are typically experts in installing, testing and monitoring equipment and systems, operating and maintaining advanced plant, and managing or supervising tradespeople in these activities. They may be expert in selecting equipment and components to meet given specifications, and assembling them into customised systems.

Engineering technicians often need to be knowledgeable about standards and codes of practice, and expert in their interpretation and application. Many develop extensive practical experience of installations, and will be more knowledgeable than a professional engineer or engineering technologist about the particulars that can affect their cost or effectiveness.

Technicians may develop expertise in aspects of design and development processes – for example, structural design detailing using advanced software, development of mechanical components and systems, manufacturing or process plant modification, customisation of electrical and electronic equipment, or the construction of experimental equipment or prototypes. Their detailed practical knowledge and experience in such areas may often complement the broader or more theoretical knowledge of professional engineers or engineering technologists.

Technicians need a good grounding in engineering science and the principles underlying their field of expertise, making their knowledge portable across applications and situations. Technicians may build on a good knowledge base with high levels of training in particular contexts or in relation to particular equipment. Aircraft maintenance is a good example.

Engineering technicians are equipped to certify the quality of engineering work and the condition of equipment and systems in defined circumstances, as laid down in standards and codes of practice. Such certification should be acceptable without further verification by others.

Current Competence as an Engineering Technician

CertETn – Certified Engineering Technician

Certified Engineering Technician (CertETn) is a register of currently competent engineering technicians that is administered by IPENZ. Registration is gained by demonstrating competence against the competence standard for engineering technicians, which is internationally benchmarked. Current competence must be demonstrated through a reassessment at no more than five-yearly intervals.

Certified Engineering Technicians are assessed in their own current practice area (the area in which their engineering skills and knowledge are up to date) and are bound by a code of ethics, which requires that they only work within their area of competence. When undertaking work they can be asked to declare in writing that they are competent to perform the task.

REA – Registered Engineering Associate

The Engineering Associates Registration Board New Zealand assesses candidates for registration as Registered Engineering Associates (REAs) under the Engineering Associates Act 1961. The criteria are a suitable qualification and experience, and the qualification requirements broadly align the register with the engineering technician occupational role. There is no statutory requirement for demonstration of current competence to maintain REA registration, but the Board recently introduced the voluntary REAcap programme to seek evidence of registrants' current work experience.

The Department of Building and Housing initiated a review of the Registered Engineering Associates Act in mid-2007.

Professional Standing in the Engineering Community

AIPENZ – Associate Membership of IPENZ

Engineering technicians can progress to Associate Membership of IPENZ by demonstrating competence against the competence standard for engineering technicians at some stage in their careers. Associate Members are in good professional standing amongst their peers.

IPENZ Members are engaged in continuing professional development, and support the development and sharing of engineering knowledge, good practice and standards. Members are bound by a code of ethics, professional development expectations and disciplinary processes.

IPENZ Practice College

The Practice College identifies those practitioners best suited to provide guidance to the governing Board of IPENZ on engineering technician practice issues. Associate Members of IPENZ who have demonstrated current competence in the last five years, usually by gaining CertETn registration, are elected as Associate Members of the IPENZ Practice College.

Qualifications for Engineering Technicians

Many engineering technicians hold the New Zealand Certificate in Engineering (NZCE), a qualification endorsed by IPENZ. This has now been replaced by the two-year Diploma in Engineering (DipE), a Level 6 qualification on the New Zealand Register of Quality Assured Qualifications. IPENZ is currently developing a process to enable these qualifications to gain formal recognition under the Dublin Accord from 2010.

The competencies expected of a graduate are described on pages 32–33.

Holders of a recognised engineering technician qualification are eligible for Graduate Membership of IPENZ (GIPENZ). Like other IPENZ Members, Graduate Members demonstrate a level of support for, and engagement with, the engineering profession in New Zealand and are bound by a code of ethics.

Competence Standard for Engineering Technicians

To be recognised as a competent engineering technician, an engineer must demonstrate that, within their practice area, they can:

- comprehend and apply detailed knowledge underpinning good practice as an engineering technician (Dublin Accord qualification level)
- comprehend and apply detailed knowledge underpinning good practice as an engineering technician that is specific to the jurisdiction in which they practise
- identify, state and analyse well-defined engineering problems in accordance with good practice for engineering
- design or develop solutions to well-defined engineering problems by applying accepted procedures and methodologies
- be responsible for making decisions on part or all of one or more well-defined engineering activities
- manage part or all of one or more well-defined engineering activities in accordance with good engineering management practice
- identify risk and apply risk management techniques to well-defined engineering activities
- conduct engineering activities to an appropriate ethical standard
- recognise the reasonably foreseeable social, cultural and environmental effects of well-defined engineering activities generally
- communicate clearly with others in the course of their well-defined engineering activities
- maintain the currency of their engineering knowledge and skills
- exercise sound engineering judgement.

The practice area of an engineering technician is defined by both the area in which they have engineering knowledge and the nature of the engineering activities performed.

Well-defined engineering:

Well-defined engineering problems have some or all of the following characteristics:

- are discrete components of engineering systems which can be solved in standardised ways
- are encompassed by standards and/or documented codes of practice
- involve a limited range of stakeholders with mostly similar needs
- involve multiple issues, but few significant conflicting constraints
- are frequently encountered and familiar to most practitioners in the relevant practice areas
- have consequences that are important locally and are not far-reaching
- involve a limited range of resources (such as people, money, equipment, materials and technologies).

Well-defined engineering activities exhibit some or all of the following characteristics:

- require knowledge and use of widely-applied operations and processes
- involve a limited range of resources
- require the use of existing techniques, materials or processes in new ways
- require resolution of interactions between limited technical and engineering issues, with little or no impact from wider issues
- have consequences that are locally important and not far-reaching

Sample credentials

John Bloggs CertETn, AIPENZ, NZCE

1. *John is registered as a Certified Engineering Technician: he currently meets the IPENZ competence standard for engineering technicians – CertETn.*
2. *John is an Associate Member of IPENZ: a mark of professional standing and adherence to a strict ethical code – AIPENZ.*
3. *John holds a New Zealand Certificate of Engineering (the discipline should not be included unless it represents his current practice field) – NZCE.*

Overseas Qualifications and Quality Marks

Qualifications from Other Countries

Mutual Recognition Agreements

IPENZ is a signatory to three international agreements which provide mutual recognition of substantially equivalent qualifications.

The Washington Accord provides for mutual recognition and international benchmarking of professional engineering qualifications. Other signatories include key work destinations for New Zealand engineers and key sources of imported talent, such as Australia, South Africa, the United Kingdom, Ireland, Hong Kong, Singapore, the United States and Canada.

The Sydney Accord provides mutual recognition and benchmarking of the three-year engineering degree as the underpinning academic qualification for engineering technologists. Other participating countries include the United Kingdom, Ireland, Canada, South Africa, Hong Kong and Australia.

The Dublin Accord benchmarks the two-year engineering diploma as the basic academic qualification for engineering technicians. Other participating countries are the United Kingdom, Ireland, South Africa and Canada. IPENZ became a provisional member of the Dublin Accord in 2006, but does not yet enjoy mutual recognition privileges.

A current listing of signatories and accredited programmes under each agreement can be found at www.ieagreements.org

Employers of overseas engineers can be confident that holders of qualifications accredited under any of these agreements have a qualification that is substantially equivalent to New Zealand qualifications recognised under that Accord.

Overseas Qualification Assessment

Qualifications from non-Accord countries may have been assessed for immigration proposes by the Qualifications Evaluation Service of the New Zealand Qualifications Authority (NZQA). These assessments typically benchmark the overseas qualification to a level on the National Qualifications Framework, not to a specific engineering qualification. This may mean that qualifications IPENZ might compare to a four-year Bachelor of Engineering or a three-year Bachelor of Engineering Technology are both assessed as equivalent to a degree at Level 7 on the National Qualifications Framework. Only in cases where NZQA assesses a qualification as equivalent to a Bachelor of Engineering from a New Zealand university can you be confident that the qualification is equivalent to a Washington Accord degree.

The NZQA assessment confirms the authenticity of a qualification and the general academic level of the programme of study, but does not in any way assess the attributes of the qualification holder.

NZQA also assesses non-degree engineering qualifications. To be recognised by IPENZ as equivalent to a Diploma of Engineering offered in New Zealand, an overseas qualification would need to be assessed by NZQA as equivalent to a Level 6 Diploma of Engineering on the National Qualifications Framework.

Overseas Competence-based Titles

A number of overseas memberships and registers have substantially equivalent entry requirements to those applied by IPENZ. For example, CPEng in New Zealand, CPEng in Australia, CEng in the United Kingdom and PEng in North America all recognise professional engineers who have demonstrated competence for independent practice.

While initial registration standards are substantially equivalent, the requirements for continued registration vary as no jurisdiction other than New Zealand has adopted a requirement for registrants to demonstrate current competence periodically. In this respect, overseas registers, which typically require registrants to undertake a certain amount of continuing professional development, are more closely aligned with the equivalent competence-based IPENZ Membership class, which carries an ethical obligation to maintain competence through undertaking continuing professional development. In all cases engineers are ethically bound to work within the bounds of their competence.

The different approaches to continued registration, coupled with the fact that registration in an overseas jurisdiction does not require candidates to formally demonstrate competence to practice in the New Zealand context means that if these overseas titles are used in New Zealand, the country of issue should be included in parentheses, for example CEng(UK). The Chartered Professional Engineers Act of New Zealand 2002 makes this a legal requirement for overseas quality marks that could be confused with CPEng registration in New Zealand.

The extent of credit given for specific overseas memberships/registrations/licenses to engineers seeking competence-based Membership or registration through IPENZ is set out in the credit schedule on the IPENZ web site at www.ipenz.org.nz/ipenz/forms/pdfs/credit_for_registrants_from_other_jurisdictions.pdf In general, admission to IPENZ Membership at the equivalent level can be granted without any further assessment or fees.

Other Professional Groups in New Zealand

ACENZ Membership (Companies)

ACENZ, the Association of Consulting Engineers New Zealand, is the representative association for engineering consulting companies in New Zealand.

To become a member of ACENZ, applicant companies must have properly competent staff and demonstrate that the firm's principles are of recognised professional standing. This may be attested to by their Membership of IPENZ.

The firm must operate as an independent consulting engineering company, with appropriate levels of professional indemnity insurance. The company is required commit to a code of ethics applicable to their consulting practice, and are subject to a relevant disciplinary process.

For more information go to www.acenz.org.nz

You can verify whether an individual engineer is appropriately qualified by searching the IPENZ competence registers at www.ipenz.org.nz/ipenz/finding But, since any contract will be with the commercial entity that employs the engineer, it is also important to confirm the organisation's standing by checking whether or not it is a member of ACENZ.

Technical Interest Groups

In addition to joining IPENZ many engineers also choose to join an IPENZ Technical Interest Group, an IPENZ Collaborating Technical Society, or another technical society. These organisations exist to develop and share new knowledge in specialist areas. Membership is not tied to competence, so cannot be regarded as a quality mark in itself, but it does indicate engagement with professional peers and commitment to keeping abreast of new technical knowledge.

IPENZ Technical Interest Groups include:

- Australasian Association for Engineering Education (joint with Engineers Australia)
- Australasian Tunnelling Society (joint with Engineers Australia)
- Electrotechnical Group
- Food Engineering Association of New Zealand
- Maintenance Engineering Society
- Mechanical Engineering Group
- New Zealand Coastal Society
- New Zealand Society for Sustainability Engineering and Science
- New Zealand Society on Large Dams
- Railway Technical Society of Australasia (joint with Engineers Australia)
- Recreation Safety Engineering Group
- Road Transport Certifying Engineers
- Society of Fire Protection Engineers
- Transportation Group
- Technology Education New Zealand
- Urban Design Forum

Technical societies collaborating with IPENZ include:

- Civil Engineering Testing Association of New Zealand
- Energy Management Association
- Ingenium (Association of Local Government Engineers New Zealand)
- New Zealand Concrete Society
- New Zealand Geotechnical Society
- New Zealand Institution of Gas Engineers
- New Zealand Society for Earthquake Engineering
- Society of Chemical Engineers New Zealand
- Society of Materials New Zealand
- Structural Engineering Society New Zealand
- Timber Design Society

Other technical societies include:

- New Zealand Water and Wastes Association
- Electricity Engineers' Association
- New Zealand Computer Society

Practice Areas, Practice Fields and Disciplines

An engineer's expertise is defined by the discipline of their degree, their practice area and their practice field. These terms are explained below.

Disciplines

When working towards an engineering qualification a person normally specialises in one engineering discipline, such as civil or mechanical engineering.

Each discipline reflects a broad body of engineering knowledge within which an engineer may initially study.

Practice Areas

Every engineer is deemed to have a practice area. It exists in the form of a succinct statement of the types of work that the engineer declares he or she is competent to carry out by having kept up to date with new engineering knowledge and techniques. Engineering's diversity means it is unlikely that other engineers have exactly the same practice area. The practice area of an engineer may evolve during his or her career, often becoming more specialised.

In assessments of current competence, each engineer is assessed within the practice area that he or she defines. The assessment panel confirms that the practice area description is suitable for the individual concerned.

When engineers declare that they are competent to perform a task, they are implying that the task is aligned with their practice area.

Practice Fields

Practice fields are deemed to exist when there is a recognisable body of knowledge developed and maintained amongst a community of practitioners. The following list of 17 fields has been agreed internationally:

Aeronautical
Bio
Building Services
Chemical
Civil
Electrical
Environmental
Fire
Geotechnical
Industrial
Information
Management
Mechanical
Mining
Petroleum
Structural
Transportation

Practice fields are often more specialised than the engineering disciplines used in the tertiary education sector. Because engineering is so multidisciplinary, practice fields often overlap and are not defined uniquely. Civil engineering, for example, is often seen to include geotechnical, structural and environmental engineering.

While practice fields are a useful broad guide, they should not be used to decide whether a practitioner is competent to perform a particular task. A practitioner within a field need not be familiar with the whole body of knowledge in that field. For example, a structural engineer could be competent in certain (but not all) types of laminated wood buildings, competent in some (but not all) types of steel structures, and competent in only the most basic concrete structures. A civil engineer might be competent in the design of simple structures, but classifying him or her in the structural field might overstate his or her structural competence.

It is therefore vitally important that, when you need to be assured that an engineer is competent in a specific area of practice, you should seek a declaration from the engineer that he or she is competent to perform the task.

In assessments of current competence, practice fields are used to assist in appointing assessors, but are not recorded in conjunction with any quality mark.

Developing and Maintaining Competence

An academic engineering qualification involves two to four years of academic study, with little or no practical experience. Competence as a practitioner is only achieved after a number of years of practice. Once engineers have developed competence, they must ensure that it is maintained.

Developing Competence

An academic engineering qualification does not by itself make someone a competent engineering practitioner; the practice skills required to become a competent practitioner are developed during employment. Graduate engineers are expected to work for four to five years under supervision and with the guidance of a mentor while they develop practical skills to supplement their academic learning. They then apply to have their competence assessed, and if successful they gain the right to use various quality marks postnominally (after their names) in addition to their academic credentials. IPENZ provides graduate development support, sometimes in conjunction with employers through the Professional Development Partner programme (see page 28), to assist graduates in their competence development.

Maintaining Competence

Competence can be developed further through work experience and continuing professional development – or it can be eroded by a failure to maintain currency of knowledge and skills.

It is important for professionals to take active steps to retain or develop competence, and to demonstrate their current competence to their peers from time to time.

Quality marking of competence is different from awarding a qualification. A qualification signals that a person has, at a particular point in time, achieved certain knowledge and skills. Some knowledge and skills are retained for life, but much of the detailed technical knowledge in a qualification becomes outdated, so less reliance can be placed on the value of an engineer's original qualification as his or her career progresses. Quality marks of current competence therefore become more relevant.

Continuing Professional Development

Most professionals recognise the need for professional updating. Continuing Professional Development (CPD) is the systematic updating and enhancement of skills, knowledge and competence which takes place throughout working life. Put simply, a life-long learning approach to planning, managing and getting the most from your own development.

CPD is *continuing* because learning never ceases, regardless of age or seniority.

It is *professional* because it is focused on personal competence in a professional role.

It is concerned with *development* because its goal is to improve personal performance and enhance career progression and is much wider than just formal training courses.

People differ significantly in the ways in which they learn best. A large proportion of effective learning takes places within the working environment but is not always recognised as being of relevance. We all learn by doing, which includes our successes and mistakes.

The essential CPD principles:

- Development should be owned and managed by the individual learner.
- Development should be continuous in the sense that professionals should always be actively seeking improved performance.
- Continuing Professional Development is a personal matter and the effective learner knows best what they needs to learn.
- Learning objectives should be clear and – wherever possible – serve organisational or clients' needs as well as individual goals.
- Regular investment of time in learning should be seen as an essential part of professional life, not an optional extra.

IPENZ Professional Development Partners

The main objective of the IPENZ Professional Development Partner programme is to identify organisations which support the objectives of IPENZ and give Members support and guidance in developing, demonstrating and maintaining the competencies (skills, knowledge and personal qualities) expected of engineering practitioners.

IPENZ PDPs are expected to have systems in place which provide evidence that they acknowledge their responsibility to invest in the career and professional development of their engineering staff for the benefit of the individual and for the long-term benefit of the organisation and the engineering profession as a whole.

The specific objective of the IPENZ PDP programme is to help engineers to select potential employers who:

- have an organisational culture and human resource development system that embrace career and professional development
- benchmark their engineering standards to the IPENZ competence standards and quality marks
- operate competence development and continuing professional development systems for staff that are endorsed by IPENZ and aligned with IPENZ requirements for competence assessment
- support the development and maintenance of standards in the engineering profession
- ensure Graduate Members of IPENZ get access to the work experience and learning opportunities (both on- and off-job), needed to acquire the competencies expected of engineers
- be inclusive of all engineers, engineering technologists and engineering technicians in their programmes and the benefits that are on offer
- encourage experienced engineers to actively engage with the engineering profession and gain recognition of their engineering competence through the appropriate competence-based Membership class and register
- support engineers to maintain and develop their professional competence in order to satisfy requirements for continued registration
- formalise a mutually beneficial relationship between IPENZ and employing organisations based on a commitment to career and professional development, professional registration and professional engagement.

Advice for Users of Engineering Services

Here is some specific advice for regulators, purchasers of engineering services, and employers of engineers.

Advice for Regulators

Some regulations require that certain areas of work are performed by a Chartered Professional Engineer or a Registered Engineering Associate.

For work where regulators can make discretionary decisions, such as accepting producer statements under the Building Act, IPENZ recommends that:

- the nature of the work is assessed against the engineering occupational roles described on pages 6–19 to establish whether the work should be undertaken by a professional engineer, an engineering technologist or an engineering technician
- current competence registers are used to identify currently competent engineers (CPEng, ETPract, CertETn)
- among those who are currently competent, preference be given to practitioners holding a mark of professional standing (such as IPENZ Membership), since they are kept informed of professional issues and participate in professional networks
- engineers be required to self-declare that they are competent to perform the specific work in question.

Advice for Purchasers of Engineering Services

It is important to assess the type of work to be done to ensure you engage the appropriate engineer.

- For work characterised as complex engineering use a professional engineer (see pages 6–11).
- For work characterised as broadly-defined engineering use an engineering technologist (see pages 12–15).
- For work characterised as well-defined engineering use an engineering technician (see pages 16–19).

When using a consulting engineering business, it is recommended that you ensure that it is a member of ACENZ (see page 22).

Ensure that any engineer you employ is currently competent (CPEng, ETPract, CertETn). Ask the engineer to declare that he or she is competent to do your work.

If recent graduates will be providing engineering services for you, check that they are Graduate Members of IPENZ and thereby bound by the IPENZ Code of Ethics, and check that their work will be properly supervised by senior engineers.

The best way to verify whether an engineer is appropriately qualified is to check their qualifications and credentials by searching the IPENZ competence registers at www.ipenz.org.nz/ipenz/finding

Guidelines when Employing or Recruiting Engineers

The information given in the earlier sections should help employers and employment consultants to "size" engineering roles to ensure the right engineer is employed in each position.

An engineering career can be divided into five stages:

Stage 1 – Graduate Development
Stage 2 – Independent Practice
Stage 3 – Team Leader
Stage 4 – Technical Manager
Stage 5 – General Manager

Engineers generally reach Stage 2 after four to five years of applied experience post-graduation and may progressively move on to roles at Stages 3 and 4. IPENZ current competence registers benchmark the level of competence required to operate at Stage 2 and continue to be directly relevant to engineers at Stage 3, but may or may not continue to be relevant to engineers at Stages 4 and 5.

While IPENZ does not specifically assess the management competencies expected above Stage 3, Fellows of IPENZ generally exhibit competencies at Stage 4 and sometimes Stage 5, while Distinguished Fellows are typically operating at Stage 5.

Employers should rate vacant positions against the competence standards for professional engineers, engineering technologists and engineering technicians so that they seek appropriately skilled employees.

It is recommended that wording in recruitment advertisements such as "BE or similar engineering qualification, plus five years' relevant experience" is replaced with references to quality marks. For example, an advertisement for a professional engineer might require that candidates should:

- have demonstrated current competence to the appropriate standard, for example CPEng
- be practising in a field such as those on the list on page 25
- be Professional Members of IPENZ

Where employers are looking for recent graduates and are prepared to help them with a graduate development programme, they should use the graduate profiles on pages 32–33 to decide which qualification (BE, BEngTech or DipEng) is most appropriate.

It is not appropriate to say that any of the three qualifications will do – each has a distinct character and competence profile. Employers should understand that the graduates they employ must further develop their practice skills.

Check the IPENZ website www.ipenz.org.nz to see if a graduate engineer's qualifications have been accredited by IPENZ. If a prospective employee has an overseas qualification, refer to pages 20–21 for advice on how this might be interpreted.

Engineering Graduate profiles:

An Engineer With This Qualification:	Four-year BE Degree
Internationally benchmarked to	**Washington Accord** for Professional Engineers (MIPENZ, CPEng)
Knowledge of Engineering Sciences Can understand and apply the mathematical and engineering sciences relevant to:	one or more of the general engineering disciplines eg mechanical, civil or electrical etc
Analysis and Problem Solving Can formulate and solve models to predict the behaviour of part or all of:	*complex engineering*[1] systems using the first principles of the engineering sciences and mathematics
Design and Synthesis Can synthesise, and demonstrate the efficacy of solutions to part or all of:	*complex engineering*[1] problems
Investigation and Research Can recognise when further information is needed and find it by:	identifying, evaluating and drawing conclusions from all pertinent sources of information; designing and carrying out experiments
Risk Management Understands methods of dealing with uncertainty (such as safety factors) and the limitations of applicability of methods of design and analysis; is able to:	identify, evaluate and manage physical risks in *complex engineering*[1] problems
Teamwork Functions effectively in a team by:	working co-operatively, with the capability to lead or manage a team
Communication Communicates clearly by:	writing effective reports and design documentation, summarising information, making effective oral presentations and giving clear oral instructions, and understanding such communications from others
The Engineer and Society Shows awareness of the role of engineers and their responsibility to society by:	demonstrating understanding of the general responsibilities of a professional engineer
Management and Financial Understands, selects and applies:	appropriate project and business management principles and tools to *complex engineering*[1] problems
Practical Knowledge Demonstrates competence in the practical art of engineering in their area of specialisation by:	incorporating into design an understanding of the practical methods of constructing and maintaining engineering products, and using modern calculation and design tools competently to solve *complex engineering*[1] problems
	[1] refer to page 10

Three-year BEngTech Degree	Two-year DipE (Level 6 On NQF)
Sydney Accord for Engineering Technologists (TIPENZ, ETPract)	**Dublin Accord** for Engineering Technicians (AIPENZ, CertETn)
one or more practice fields within a specific engineering discipline eg construction, manufacturing, roading etc	one or more specialised fields of engineering activity eg aircraft maintenance, or HVAC etc
broadly-defined engineering[2] systems using analytical tools appropriate to their discipline or area of specialisation	*well-defined engineering*[3] systems using codified methods of analysis specific to their field of engineering
broadly-defined engineering[2] problems	*well-defined engineering*[3] problems
locating, searching and selecting relevant data from codes, databases and literature; designing and carrying out experiments	locating and searching relevant codes and catalogues; carrying out standard tests
identify, evaluate and manage physical risks in *broadly-defined engineering*[2] problems	identify, evaluate and manage physical risks in *well-defined engineering*[3] problems
working co-operatively and understanding team dynamics	working co-operatively and understanding team dynamics
writing effective reports and design documentation, making effective oral presentations and giving clear oral instructions, and understanding such communications from others	comprehending codes, specifications, drawings and instructions, documenting their own work clearly, and giving clear instructions
demonstrating understanding of the general responsibilities of an engineering technologist	demonstrating understanding of the general responsibilities of an engineering technician
appropriate project management and costing methods to *broadly-defined engineering*[2] problems	appropriate project management and costing methods to *well-defined engineering*[3] problems
interpreting the general designs of others to provide detailed, practical designs for construction/production and/or management of construction or maintenance; and applying appropriate techniques, resources and current engineering tools to *broadly-defined engineering*[2] problems	applying appropriate techniques, resources and current engineering tools to *well-defined engineering*[3] problems with an awareness of their limitations
[2] refer to page 14	[3] refer to page 18

Making a Complaint

All members of the engineering profession are expected to practice in a competent, diligent and ethical way. A person who considers that an engineer has not acted competently or ethically, or has acted negligently, is entitled to make a complaint which will lead to IPENZ investigating the engineer's behaviour.

Complaints can be made on one of three bases:

- Incompetence (a pattern of unsatisfactory work): a competent engineer may make an occasional mistake, but incompetence is suggested by recurring work below an acceptable professional standard.
- Negligence (insufficient care in a particular instance): an engineer who is generally competent can be negligent in a particular situation, and if so they must face the consequences. Making a simple mistake is not in itself negligence, negligence is the result of insufficient care.
- Unethical practice (in breach of the IPENZ Code of Ethics or CPEng Code of Ethical Conduct as is appropriate): engineers must act ethically and meet the moral standards set by the profession as a whole. For example, an engineer who fails to maintain client confidentiality may be competent and not negligent, but still be in breach of the ethical code of the profession.

Complaints should be made directly to IPENZ. The regulations under which complaints are processed are available at www.ipenz.org.nz The IPENZ Code of Ethics and CPEng Code of Ethical Conduct are available at the same location.

IPENZ Jurisdiction

IPENZ will act on a complaint provided it has jurisdiction over the engineer concerned. IPENZ has jurisdiction over members of the wider engineering profession who are currently registered holders of a current competence quality mark (CPEng, IntPE, ETPract, IntET, CertETn) and current Members of IPENZ. In addition, IPENZ has jurisdiction over any engineer who is no longer a Chartered Professional Engineer, but who was a Chartered Professional Engineer at the time of the relevant conduct. IPENZ has no jurisdiction over other engineers.

IPENZ does not have jurisdiction over fees charged for work, and is not a mediator to resolve commercial disputes. If informed of such matters IPENZ will try to guide complainants to other mechanisms to resolve the issues.

Appeals for CPEng

The outcome of any complaint or disciplinary process that is undertaken by IPENZ as the Registration Authority and involves a Chartered Professional Engineer can be appealed to the Chartered Professional Engineers Council.

Applicants for CPEng are also able to appeal to the Council over any competence assessment decision made by the Registration Authority.

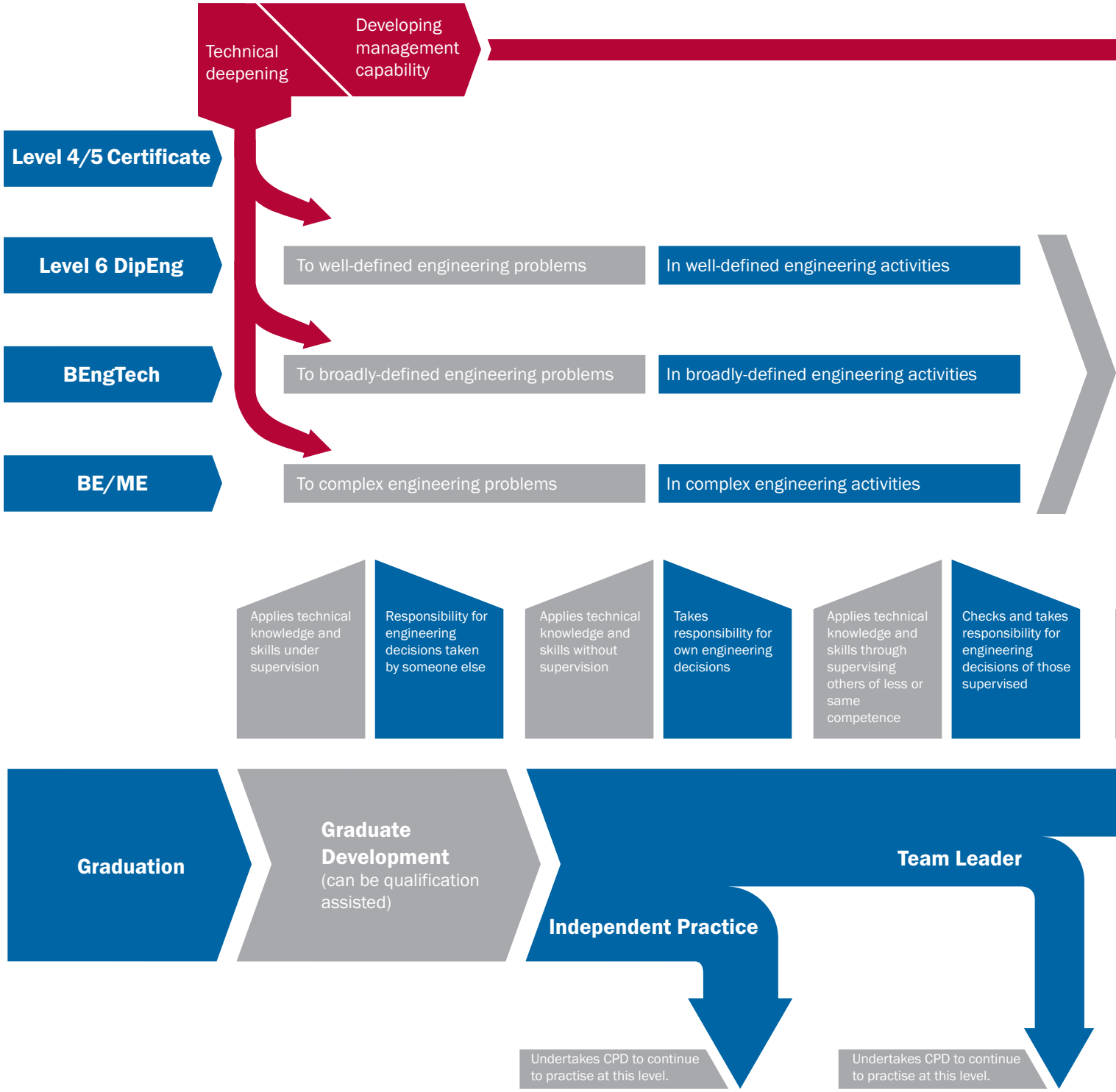
For information on the CPEng Council go to www.cpec.org.nz

Notification of Concern Over Performance

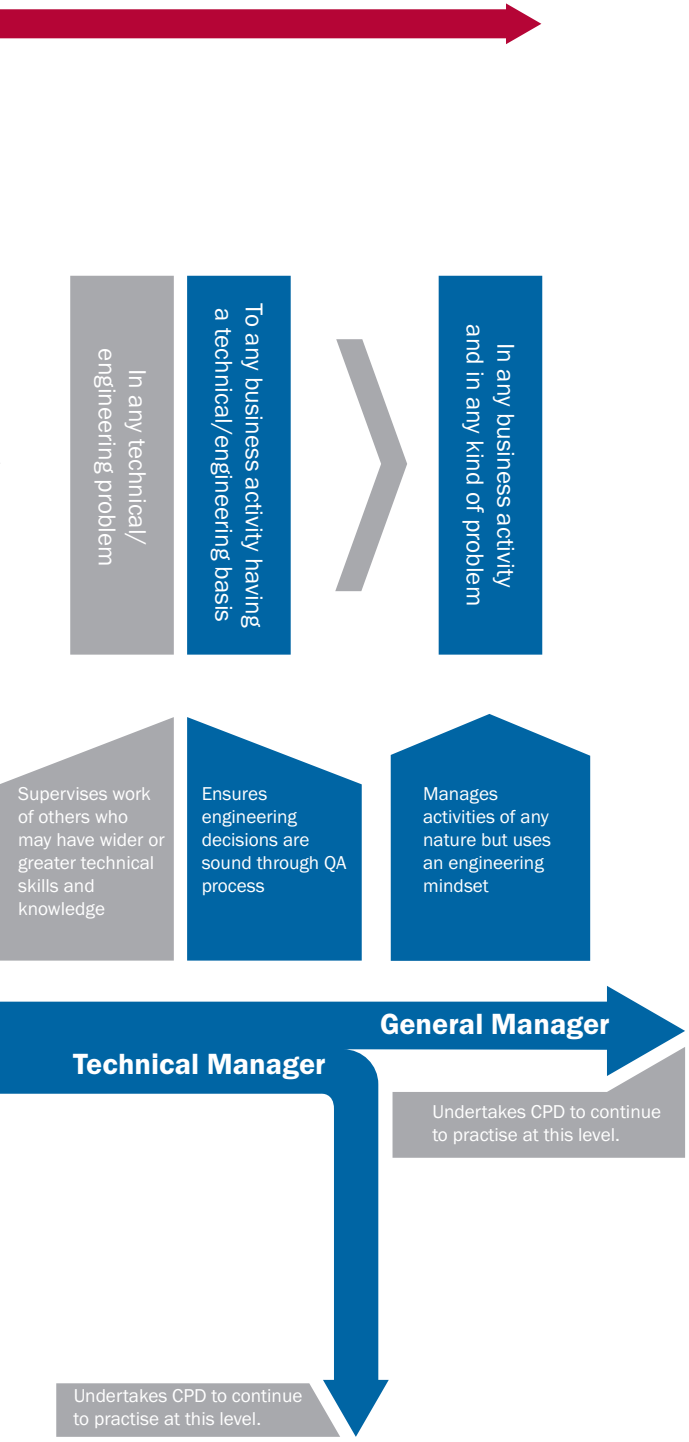
Regulators or consumers who are dissatisfied with some aspect of the quality of the work undertaken by a member of the engineering profession over whom IPENZ has jurisdiction should document their concerns in writing to the engineer, providing a copy to IPENZ.

On receipt of a letter of notification, IPENZ will consider whether the notice is an isolated incident, or whether other notices have been received. If there is any suggestion of a lack of competence, IPENZ can require the engineer to undertake an immediate reassessment of competence for continued registration on any current competence register.

If there is evidence of a breach of ethical conduct or of negligence or incompetent practice of a serious nature, IPENZ can initiate a complaints investigation of its own motion.


Technical deepening
Developing management capability
Level 4/5 Certificate
Level 6 DipEng
To well-defined engineering problems
In well-defined engineering activities
BEngTech
To broadly-defined engineering problems
In broadly-defined engineering activities
BE/ME
To complex engineering problems
In complex engineering activities
Applies technical knowledge and skills under supervision
Responsibility for engineering decisions taken by someone else
Applies technical knowledge and skills without supervision
Takes responsibility for own engineering decisions
Applies technical knowledge and skills through supervising others of less or same competence
Checks and takes responsibility for engineering decisions of those supervised
Graduation
Graduate Development
(can be qualification assisted)
Independent Practice
Team Leader
Undertakes CPD to continue to practise at this level.
Undertakes CPD to continue to practise at this level.

Career Model



This diagram sets out 5 potential stages of an engineering career. Definitions of the terms “complex”, “broadly-defined” and “well-defined” engineering problems/activities can be found on pages 11, 15 and 19.

The model makes a distinction between career development pathways that involve technical deepening (gaining more engineering knowledge so that more complex engineering problems can be tackled) and development of management capability (developing skills to take responsibility for more than one’s own activities). The model makes it clear that technical deepening is not necessary to progress in management.

The five potential career stages can be generally described as follows:

Stage 1 – Graduate Development: Engineers in the period after entering the profession, who are developing competence for independent practice under supervision.

Stage 2 – Independent Practice: Engineers who are competent to practice independently. This is benchmarked against the relevant competence standard and evidenced by competence-based membership and registration.

Stage 3 – Team Leadership: Engineers taking overall responsibility for the work of a team in which they are the most expert.

Stage 4 – Technical Management: Engineers supervising the work of others who may have greater or wider competence.

Stage 5 – General Management: Engineers who are involved in management at an organisational level and may no longer directly involved with technical engineering activities.

IPENZ Graduate Membership (GIPENZ) indicates that an engineer has an appropriate academic preparation for entry to the profession at Stage 1. IPENZ current competence registers provide a benchmark for engineers practising at Stage 2 and remain relevant to engineers at Stage 3. Current competence registers are specifically for engineers practising in engineering or engineering management. From the smaller numbers of engineers at Stage 4 and Stage 5, some may decide that the case to continue on a current competence register is less compelling. Like engineers at other career stages, engineers at Stages 4 and 5 can continue to enjoy the benefits of IPENZ Membership or Fellowship.