AUSTRALIAN ENGINEERING COMPETENCY STANDARDS STAGE 2 - THE EXPERIENCED ENGINEERING TECHNOLOGIST

The Stage 2 Competency Standards are the profession's expression of the knowledge and skill base, engineering application abilities, and professional skills, values and attitudes that must be demonstrated in order to practise independently or unsupervised as an engineering technologist. It goes beyond the ability to perform specific tasks.

Purpose of the Stage 2 Competency Standards

The Stage 2 Competency Standards are used as the basis of assessment for Chartered membership of Engineers Australia (CEngT) and registration on the National Engineering Register (NER).

Chartered membership is exclusive to Engineers Australia. It is a professional credential recognised by government, business and the general public worldwide. The achievement of CEngT brings with it a career-long obligation to maintain competence in a chosen area of operation.

What is expected of an experienced engineering technologist?

The community has certain expectations of experienced engineering technologists, their competence, how they apply this competence and how they will conduct themselves.

Experienced engineering technologists:

- take responsibility for engineering projects, services, functions and facilities within a technology domain, for specific interactions with other aspects of an overall operating context and for managing the contributions of their specialist work to a broader engineering system or solution
- focus on sustainable solutions and practices which optimise technical, social, environmental and economic outcomes within the technology domain and over a whole systems life cycle
- have an intimate understanding of the standards and codes of practice that underpin the technology domain and ensure that technology outcomes comply with statutory requirements
- interact effectively with Professional Engineers and Engineering Associates, with other professionals, tradespersons, clients, stakeholders and society in general, to ensure that technology outcomes and developments fully integrate with the overall system and context
- ensure that all aspects of a technological product or operation are soundly based in theory and fundamental principle
- understand how new developments relate to their specific field of expertise
- interpret technological possibilities, to investigate interfaces, limitations, consequences, costs and risks
- combine the need for a strong understanding of practical situations and applications, with the intellectual challenge of keeping abreast of leading-edge developments as a specialist in a technology domain and how these relate to established practice.
- need a strong understanding of scientific and engineering principles and a well-developed capacity for analysis
- are concerned with applying current and emerging technologies, often in new contexts; or with the application of established principles in the development of new practice
- also contribute to the advancement of technology
- operate within broadly defined technical environments, and undertake a wide range of functions and responsibilities
- specialise in the theory and practice of a particular branch of engineering technology or engineering-related technology (the technology domain) and, specifically, in its application, adaptation or management, in a variety of contexts.
- are familiar with the current state of development of a technology domain and most recent applications of the technology
- within their specialist field, expertise may be at a high level, and fully equivalent to that of a Professional Engineer
- may not however, be expected to exercise the same breadth of perspective as Professional Engineers, or carry the same wide-ranging responsibilities for stakeholder interactions, for system integration, and for synthesising overall approaches to complex situations and complex engineering problems
- may lead teams responsible for the implementation, operation, quality assurance, safety, management, and maintenance of projects, plant, facilities, or processes within specialist practice area(s) of the technology domain

Engineering Technologists may establish their own companies or may move into senior management roles in engineering and related enterprises, employing Professional Engineers and other specialists where appropriate

Stage 2 competency standards

The Stage 2 competency standards are generic in the sense that they apply to all disciplines of engineering in four units:

- personal commitment
- obligation to community
- value in the workplace
- technical proficiency

Each unit contains elements of competence and indicators of attainment. The elements of competence are the capabilities necessary to the unit of competence and the indicators of attainment serve as a guide to the engineering work likely to be considered as demonstrating attainment of that competence.

Demonstration of competence – Engineering Technologist

The demonstration of competence requires the presentation of written accounts of work that involves engineering contributions - contributions based on standardised approaches associated with established engineering operations.

When selecting work experience to offer as evidence of competence, provide examples of contributions to work that has some or all of the characteristics of either an engineering problem or engineering activity as described below:

Engineering problems

- Involve a variety of factors which may impose conflicting constraints
- Can be solved by the application of well-proven analysis techniques
- Require a detailed knowledge of principles and applied procedures and methodologies in defined aspects of a professional discipline with a strong emphasis on the application of developed technology and know-how, often within a multidisciplinary engineering environment
- Belong to families of familiar problems which are solved in well-accepted ways
- Involve several groups of stakeholders with differing and occasionally conflicting needs
- Have consequences which are locally important and may extend more wisely
- Are parts of or systems within complex engineering problems

Engineering activities

- Involve a variety of resources (and for this purpose resources includes people, money, equipment, materials, information and technologies)
- Require resolution of interactions between technical, engineering and other issues, of which few are conflicting
- Involve the use of new materials, techniques or processes in non-standard ways
- Require a knowledge of normal operating procedures and processes

At any particular time, an engineering technologist applying for Stage 2 assessment would expect some areas to be developing with others at a functional or proficient level as described below.

- Developing: an aspect of practice that you are learning, with help from more experienced practitioners and possibly supervision to help you practice at an acceptable standard.
- Functional: an aspect of practice in which you have a basic capability to practice independently at an acceptable standard without help or supervision.
- Proficient: an aspect of practice in which your capability to practice independently has been recognised through formal peer review, and in which you have the capacity to help others develop their capability.

A successful assessment at Stage 2 will formalise a transfer from functional to proficient.

AUSTRALIAN ENGINEERING COMPETENCY STANDARDS STAGE 2 –ENGINEERING TECHNOLOGIST

Elements of Competence – PERSONAL COMMITMENT

This unit of competence requires you to demonstrate:

- how you deal with ethical issues when they arise
- how you keep up to date
- how you adopt a personal sense of responsibility for your work

ELEMENT OF COMPETENCE ENGINEERING TECHNOLOGIST	**What this competence means in practice**	**Indicators of Attainment** Refer to only as many Indicators of Attainment as you need to demonstrate the Element of Competence
1. Deal with ethical issues	*means* you demonstrate an understanding of the ethical issues associated with your work or practice area, and how these are managed collectively by your organisation, project or team; and *means* you demonstrate an ability to identify ethical issues when they arise, and to act appropriately	• understand ethical dilemmas in your practice area • recognise an unethical situation; take appropriate action • engage in ethical reflective practice • seek appropriate advice and consult Engineers Australia Code of Ethics
2. Practise competently	*means you* identify the competencies and resources appropriate to *engineering activities*	• maintain a concise description of your areas of competence • carry out engineering work only within the boundaries of your known areas of competence • identify and consult with appropriate persons • maintain records of Continuing Professional Development activities
3. Responsibility for *engineering activities*	*means* you adopt a personal sense of responsibility for your work	• use self-evaluation or feedback from others (peer review) to help you consider the potential outcomes of your decisions • understand the relevant standards and codes for your practice area • authorise engineering outputs in a manner consistent with relevant standards and codes • understand and interpret statutory and commercial frameworks within your own area of responsibility

Elements of Competence – OBLIGATION TO COMMUNITY

'Community' will change depending on the nature of the work you are doing. Sometimes it will be the client; sometimes the general public; sometimes your students; sometimes the regulatory authorities and sometimes it will be your employer. This unit of competence requires you to demonstrate:

- how you delivered a safe and efficient solutions
- how you defined the community and considered the community benefit at various stages of the *engineering activities* (within the context of your work)
- how you identified and managed the risks associated with the engineering activities
- how you incorporated legal and regulatory requirements into your solutions

ELEMENT OF COMPETENCE ENGINEERING TECHNOLOGIST	**What this competence means in practice**	**Indicators of Attainment** Refer to only as many Indicators of Attainment as you need to demonstrate the Element of Competence
4. Develop safe and sustainable solutions	*means* that you apply current workplace health and safety requirements; and *means* that you understand the short and long-term implications of the *engineering activities*	• provide for the safety of workers and others in design, manufacture, construction, commissioning, use, decommissioning, demolition, removal or disposal of plant, substances or structures • promote a culture of workplace safety • develop safe and efficient options, taking account of critical constraints and requirements – e.g. energy efficiency requirements • contribute to reducing adverse effects on community and environment from *engineering activities*
5. Engage with the relevant community and stakeholders	*means* that you identify the communities and stakeholders who could be affected by *engineering activities;* and *means* that you identify and interpret the needs and expectations of the relevant community and stakeholders; and *means* that you understand and consider relevant public interest issues	• identify and manage safety, environmental, public health and other public interest issues relevant to *engineering activities* • explain how *engineering activities* may affect the community and the environment • understand the reliance of others on engineering capability when engaging with the community

ELEMENT OF COMPETENCE ENGINEERING TECHNOLOGIST	**What this competence means in practice**	**Indicators of Attainment** Refer to only as many Indicators of Attainment as you need to demonstrate the Element of Competence
6. Identify, assess and manage risks	*means* that you understand and can analyse a hazard and risk framework appropriate to *engineering activities*	• identify and manage product, project, process, environmental or system risks that could be caused by material, economic or environmental factors • maintain a documented audit trail of technical and operational changes during system or product development, project implementation or process operations • follow a systematic documented method and work in consultation with stakeholders and other informed people to identify unpredictable events (threats, opportunities, and other sources of uncertainty or missing information) that could influence outcomes • identify and classify technical, safety and commercial risks • manage the consequences of identified risks or events to minimise costs and undesirable effects (e.g. delays) • help in negotiating equitable ways to share any costs and benefits between stakeholders and the community
7. Meet legal and regulatory requirements	*means* that you should be able to understand the laws, regulations, codes and other instruments which you are legally bound to apply, and apply these in your work	• identify and comply with the codes, standards of compliance or legal instruments relevant to a particular product, project or system • conduct safety audit reports (under relevant legislation) • evaluate and implement improved safety systems (under relevant legislation) • provide regulatory approvals within delegated authority for *engineering activities* • implement safety procedures under the Work Health and Safety Act

Elements of Competence – VALUE IN THE WORKPLACE

This unit of competency requires you to demonstrate:

- how you communicate in the workplace
- how you work within an organisation to provide value for stakeholders
- how you initiate, plan, lead or manage *engineering activities*
- how you exercise sound judgement in *engineering activities*

ELEMENT OF COMPETENCE ENGINEERING TECHNOLOGIST	**What this competence means in practice**	**Indicators of Attainment** Refer to only as many Indicators of Attainment as you need to demonstrate the Element of Competence
8. Communication	*means* that you communicate efficiently, honestly and effectively	• respect confidentiality obligations • collaborate effectively within engineering teams in the workplace • interpret engineering requirements from drawings, specifications or codes to technical and non-technical personnel • exercise informal leadership in order to coordinate the activities of diverse people who contribute to *engineering activities* • collaborate effectively within multi-disciplinary teams including other professions in the workplace • provide feedback, suggestions and technical advice on relevant practical issues
9. Performance	*means* that you demonstrate an ability to apply appropriate tools or processes to achieve corporate objectives while recognising personal obligations to others	• understand clearly and document the contractual relationships between all parties to an *engineering activity* • document and provide advice on predicted performance, reliability and delivery (with respect to budget and timeliness) of intended products, processes, projects and systems • maintain an attitude of operational efficiency to add value for the stakeholders of a product, process, project or system • apply operational performance systems and standards to create the greatest benefits and value for all parties to an *engineering activity* • follow agreed protocols for terms of engagement, job acceptance, client relationships and billing

ELEMENT OF COMPETENCE ENGINEERING TECHNOLOGIST	**What this competence means in practice**	**Indicators of Attainment** Refer to only as many Indicators of Attainment as you need to demonstrate the Element of Competence
10. Taking action	*means* that you manage part or all of one or more *engineering activities*	• contribute to successful proposals, bids, technical qualification and tender documents for *engineering activities* • provide initiative and leadership when coordinating technical, commercial and environmental aspects of *engineering activities* • apply and use appropriate formal coordination and management systems and organisational processes such as project management, quality management, production management, logistics, enterprise resource and planning systems, maintenance management, configuration management, information management • report progress relative to the agreed schedule, expenditure relative to the budget, provide agreed deliverables, and report on any outstanding issues • manage projects effectively, including cost, quality, safety, environmental and risk control and monitor progress and finalisation of projects • keep financial and other records to substantiate the effective application of finance and other resources provided in support of your work, in a form that is appropriate to meet the needs of agencies that will audit the conduct of the work
11. Judgement	*means* that you exercise sound judgement in *engineering activities*	• choose appropriate technologies to deal with broadly-defined problems • deal decisively with *engineering activities* which have important consequences and some conflicting stakeholder interests • seek appropriate advice and decide whether to proceed or suspend work when faced with unexpected obstacles, performance deficiencies, impending or actual failures

Elements of Competence – TECHNICAL PROFICIENCY

This unit of competency require you to demonstrate:

- how you use advanced knowledge of technology
- how you use local engineering knowledge
- how you analyse problems
- how you develop and use technological equipment
- how you evaluate the outcomes and impacts of *engineering activities*

ELEMENT OF COMPETENCE ENGINEERING TECHNOLOGIST	**What this competence means in practice**	**Indicators of Attainment** Refer to only as many Indicators of Attainment as you need to demonstrate the Element of Competence
12. Knowledge of technology	*means* that you comprehend and apply the knowledge embodied in widely accepted procedures, processes, systems or methodologies to *engineering activities*	• maintain working knowledge of technical aids in field of operation • interpret standards and codes of practice in area of operation • use engineering knowledge and understanding to interpret engineering instructions, drawings, sketches or computer images • apply technical and practical skills to the use of state-of-the-art tools, materials, production systems and information systems
13. Local knowledge	*means* that you demonstrate the application of knowledge of local practices, technologies, materials and products	• Select and apply technical standards in field of operation • comply with local environmental aspects of standards and codes of practice • apply knowledge of first principles to link codes, standards and specifications to *engineering activities* • keep yourself informed about new and emerging technologies, techniques, products, materials and methods relevant to your field of operation • apply established properties of local materials, components and systems in field of operation
14. Problem analysis	*means* that you identify, investigate and analyse *engineering problems*	• accurately determine the main issues that require addressing in each problem and reliably identify opportunities to improve outcomes • work with customer or employer to reach an agreed understanding of the expected capability or functionality of the required product, project or system • undertake performance management measurements, condition assessment or trend analysis leading to system improvement • investigate and analyse products, projects, processes or systems

ELEMENT OF COMPETENCE ENGINEERING TECHNOLOGIST	**What this competence means in practice**	**Indicators of Attainment** Refer to only as many Indicators of Attainment as you need to demonstrate the Element of Competence
15. Advanced operation	*means* that you develop and use technological equipment skilfully, creatively and reliably	• develop the necessary capacity to skilfully interact with state-of-the-art tools, materials, production systems and information systems • develop and use new and emerging technological equipment, engineering applications and systems to create value for customer • provide feedback, suggestions and advice to others on the practical application and potential for improvement of equipment, applications and systems • skilfully operate and maintain materials, production systems and information systems to reliably produce, modify or repair products, processed materials or information • predict time, human effort and material resources needed to skilfully interact with tools, materials, production systems and information systems used in area of operation • plan, organise and supervise the use of technological equipment and systems required for state-of-the-art industrial practice
16. Evaluation	*means* that you evaluate the outcomes and impacts of *engineering activities*	• monitor and evaluate product, project or system against whole of life criteria (cost, quality, safety, reliability, maintenance, aesthetics, fitness for purpose and social and environmental impact and decommissioning) • determine criteria for evaluating a design solution and address designer obligations for work health and safety • clarify or adopt criteria for evaluation and review and evaluate the effectiveness of *engineering activities* • evaluate product, project or systems outcomes against the original specification or design intention • evaluate product, project or systems outcomes for constructability and maintainability as input to future design improvement • assess and use technical information correctly to ensure that opportunities are based on sound evidence