

AUSTRALIAN ENGINEERING COMPETENCY STANDARDS

STAGE 2 -

EXPERIENCED PROFESSIONAL ENGINEER IN LEADERSHIP AND MANAGEMENT

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.

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 (CPEng).

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

What is expected of an experienced professional engineer in leadership and management?

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

Experienced professional engineers as leaders and managers

- understand the requirements of clients, wide ranging stakeholders and of society as a whole
- work to optimise social, environmental and economic outcomes over the full lifetime of the system, service, process and program
- ensure that the managerial contribution is properly integrated into the totality of the project, process or program
- interact effectively with other disciplines, professions and people
- are responsible for:
 - interpreting technological possibilities to society, business and government
 - ensuring, as far as possible, that policy decisions are properly informed by possibilities and consequences
 - ensuring that costs, risks and limitations are properly understood in the context of the desirable outcomes
 - bringing knowledge to bear from multiple sources to develop solutions to complex problems and issues
 - ensuring that technical and non-technical considerations are properly integrated
 - managing risk as well as sustainability issues
 - ensuring that all aspects of a project, program or process are soundly based in theory and fundamental principle
 - understanding clearly how new developments relate to established practice and experience and to other disciplines with which they may interact

While the outcomes of engineering generally have physical forms, the work of experienced professional engineer managers recognises the interaction between people and technology. Professional engineers may conduct research concerned with advancing the science of engineering and with developing new principles and technologies within a broad engineering discipline. As

experienced leaders and managers, they may call on their engineering qualifications and experience, either directly or indirectly, and apply acquired skills, knowledge and judgement to the leadership and management of many sectors including Defence, Industry, Commerce and Government.

Stage 2 competency standards

The Stage 2 competency standards are generic in the sense that they apply to professional engineers in leadership and management roles, 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 provided in this guideline serve as a guide to the managerial and leadership roles likely to be considered as demonstrating attainment of that competence.

Demonstration of competence – Professional Engineers in leadership and management roles

The demonstration of competence requires the presentation of written accounts of work that involves leadership and management contributions based on the bodies of knowledge associated with established management theory and practices. Applicants for recognition as CPEng in the College of Leadership and Management will be expected to be working with substantial leadership and management complexities. The complexity of their work will be broadly comparable to the complexity of technical work used to demonstrate competence by engineers engaged in their original discipline.

When selecting work experience to offer as evidence of competence, provide examples of contributions to leadership and management that have some or all of the characteristics of either management problems or leadership and management activities as described below:

Management problems

- Involve wide-ranging or conflicting, sociological, environmental and other requirements
- Have no obvious solution and require abstract thinking and originality in analysis to formulate suitable model
- Require the application of first principles
- Involve infrequently encountered issues
- Have complex or conflicting stakeholder requirements and consequences that involve diverse groups of stakeholders with widely varying needs
- Can be dissected into component parts or sub-problems
- Require the creation of successful, timely managerial solutions.

Leadership and management activities

- Involve the coordination of diverse resources (and for this purpose, resources include people, money, equipment, systems, information and technologies) in the timely delivery of outcomes
- Require resolution of significant problems arising from interactions between wide-ranging or conflicting sociological, environmental or other requirements
- Involve creative use of management principles and knowledge, much of which is at, or informed by, the forefront of a management practices
- Have significant consequences in a range of contexts, characterised by difficulty of prediction and mitigation
- Can extend beyond previous experiences by applying first principles
- Require the achievement of successful outcomes on time and on budget.

At any particular time, a professional engineer 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 – PROFESSIONAL ENGINEER IN LEADERSHIP AND MANAGEMENT ROLE

Elements of Competence – PERSONAL COMMITMENT

This unit of competence requires you to demonstrate:

- how you deal with ethical issues when they arise
- how you develop and define your areas of competence
- how you display a personal sense of responsibility for your work

ELEMENT OF COMPETENCE – PROFESSIONAL ENGINEER	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	<p><i>means</i> you anticipate the consequences of your intended action or inaction and understand how the consequences are managed collectively by your organisation, project or team; and</p> <p><i>means</i> you demonstrate an ability to identify ethical issues when they arise and to act appropriately</p>	<ul style="list-style-type: none"> • appraise and respond appropriately to ethical dilemmas in your practice area • recognise an unethical situation; take appropriate action • engage in ethical reflective practice <p>Ref: Engineers Australia Code of Ethics</p>
2. Practise competently	<p><i>means you</i> assess, acquire and apply the competencies and resources appropriate to <i>leadership and management activities</i></p>	<ul style="list-style-type: none"> • regularly assess your own competence (in the absence of assessment by more experienced leader or manager) and continually acquire new knowledge and skills. • maintain a concise description of your areas of competence and operate within their boundaries. • maintain records of Continuing Professional Development activities.

ELEMENT OF COMPETENCE – PROFESSIONAL ENGINEER	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
3. Responsibility for leadership and management activities	<p><i>means</i> you display a personal sense of responsibility for your work; and</p> <p><i>means</i> you clearly acknowledge your own contributions and the contributions from others and distinguish contributions you may have made as a result of discussions or collaboration with other people</p>	<ul style="list-style-type: none"> • consistently document work in a way that would enable another person of comparable ability to continue and complete your work should you be unable to do so due to circumstances beyond your control • seek peer reviews and comments of your own contributions, and make improvements to work based on their suggestions • provide reviews and constructive comments to help others improve their own work • authorise managerial decisions only on the basis of an informed understanding of the costs, risks, consequences and limitations

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

ELEMENT OF COMPETENCE – PROFESSIONAL ENGINEER	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	<p><i>means</i> that you apply and implement current workplace health and safety requirements; and</p> <p><i>means</i> that you identify the economic, social and environmental impacts of <i>management activities</i>; and</p> <p><i>means</i> that you anticipate and manage the short and long-term effects of your industry, business or government activity</p>	<ul style="list-style-type: none"> • provide for the safety of workers and others in design, manufacture, construction, commissioning, use, decommissioning, demolition, removal and disposal of plant, products, substances or structures • take into account well-accepted standards of practice for design safety, while making the most economic use of financial, human effort, energy and material resources • develop sustainable business solutions that balance the impact of present business activities with the economic, social and environmental prospects of future generation • manage engineering or non-engineering activities to enhance the economic, social and environmental prospects of future generations
5. Engage with the relevant community and stakeholders	<p><i>means</i> you identify stakeholders, individuals or groups of people who could be affected by the short, medium and long-term outcomes of <i>leadership and management decisions</i>, or could exert influence over the outcomes, including the local and wider community; and</p> <p><i>means</i> you identify stakeholder interests, values, requirements and expectations using the terminology of the stakeholder through consultation and accurate listening; and</p> <p><i>means</i> you work ethically to influence perceptions and expectations of stakeholders and negotiate acceptable outcomes in the best overall interest of relevant communities.</p>	<ul style="list-style-type: none"> • consider safety, environmental, public health and other public interest issues relevant to the industry, business or government activity • engage responsibly with appropriate communities to convey information on the consequences of industry, business or government decisions and potential solutions to <i>management challenges</i> • take into account the reliance of others on engineering expertise when engaging with the community

ELEMENT OF COMPETENCE – PROFESSIONAL ENGINEER	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	<i>means</i> that you develop and operate within a hazard and risk framework appropriate to <i>your</i> industry, business or government activity	<ul style="list-style-type: none"> • identify, assess and manage project, process, environmental or system risks that could be caused by material, economic, social or environmental factors • establish and maintain a documented audit trail of technical and operational changes during system or service development, change management or service delivery • 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 • assess the likelihood of each event, and the consequences, including commercial, reputation, safety, health, environment, regulatory, legal, governance, and social consequences • devise ways to influence the likelihood and consequences to minimise costs and undesirable consequences, and maximise benefits • help in negotiating equitable ways to share any costs and benefits between stakeholders and the community
7. Meet legal and regulatory requirements	<i>means</i> that you should be able to demonstrate an understanding of the laws, regulations, codes and other instruments which you are legally bound to apply, and apply these in your work	<ul style="list-style-type: none"> • Identify and comply with business codes, standards of compliance or legal instruments relevant to a particular business, project, process or system • develop commercial contracts that cover procurement of services, professional expertise, feasibility studies, access to information or employment • seek advice, rulings or opinions from time to time to ensure that your understanding of legal and regulatory requirements is up-to-date • practise within legal and regulatory requirements • negotiate appropriate approvals from regulatory authorities for development activities • protect intellectual property

Elements of Competence – VALUE IN THE WORKPLACE

This unit of competency requires you to demonstrate:

- how you collaborate and work with others
- how you work within an organisation to provide value for stakeholders
- how you initiate, plan, lead or manage and secure financial and other material resources to support industry, business or government activity
- how you apply your professional judgement

ELEMENT OF COMPETENCE – PROFESSIONAL ENGINEER	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	<p><i>means</i> you can communicate in a variety of different ways to collaborate with other people, including accurate listening, reading and comprehension, based on dialogue when appropriate; and</p> <p><i>means</i> you can speak and write, taking into account the knowledge, expectations, requirements, interests, terminology and language of the intended audience</p>	<ul style="list-style-type: none"> • respect confidentiality obligations • build and maintain collaborative relationships with other people, gaining their respect, trust, confidence and willing, conscientious collaboration • exercise informal leadership in order to coordinate the activities of diverse people who contribute to <i>leadership and management activities</i> • collaborate effectively within multi-disciplinary teams including other professions in the workplace • lead and sustain discussion with others and, where appropriate, integrate their views to improve deliverables • convey new concepts and ideas to technical and non-technical stakeholders • deliver clear written and oral presentations on commercial, policy, governance or technical matters in English or in a language appropriate to the work situation

ELEMENT OF COMPETENCE – PROFESSIONAL ENGINEER	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
9. Performance	<i>means</i> that you demonstrate an ability to apply appropriate tools or processes to achieve corporate objectives while accounting for personal obligations to the profession	<ul style="list-style-type: none"> • build, develop and maintain relationships with service, process or system owners, sponsors, partners, providers and contractors • dialogue with a client, sponsor, organisation, government or other social actors to jointly develop an accurate understanding of customer needs, opportunities and priorities, and work with them to develop solutions in terms of commercial and legal possibilities • cultivate an attitude of innovation and creativity to add value for clients or sponsors of the service, process or system • apply leadership and management performance requirements that create the greatest benefits or value for stakeholders, keeping in mind the tolerance for uncertainty of different stakeholders that are providing financial or other material resources in the anticipation of future benefits. [Performance requirements could include the need to keep to a desired schedule, long-term cost effectiveness, minimising upfront capital expense, accelerated financial returns or social or environmental benefits, service delivery and operational reliability, among others] • question the contract or agreement that governs your work, and ensure that it allows for the possibility that you may not be able to complete the work due to circumstances beyond your control

ELEMENT OF COMPETENCE – PROFESSIONAL ENGINEER	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	<i>means that you initiate, plan, lead or manage industry, business or government activity</i>	<ul style="list-style-type: none"> • contribute to successful proposals, bids, technical qualification and tender documents for industry, business or government activity • demonstrate initiative and leadership in coordinating technical, commercial, social and environmental aspects of industry, business or government activity • gain sufficient confidence from stakeholders for them to provide you with financial and other resources to conduct your work independently on the understanding that you will deliver agreed results on time within a given cost target • 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 through cost, quality, safety, environmental and risk control, scoping and integration of physical resources and people, procurement, monitoring progress and finalisation • 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	<i>means that you exercise sound judgement in leadership and management activities</i>	<ul style="list-style-type: none"> • deal decisively with <i>management activities</i> which have significant consequences and diverse or conflicting stakeholder interests • supervise, monitor and evaluate the progress of managerial work performed by other people, diagnosing performance deficiencies and negotiating appropriate remedial measures, such as providing training and assistance, and keep within allocated budgets for labour and other expenses • seek appropriate advice and decide whether to proceed or suspend work when faced with unexpected opportunities, obstacles, performance deficiencies, impending or actual failures

Elements of Competence – TECHNICAL PROFICIENCY

This unit of competency require you to demonstrate:

- how you use an advanced scientific approach to leadership and management
- how you make effective use of legal and commercial knowledge provided by other people
- how you analyse problems and how you develop creative and innovative solutions
- how you evaluate the outcomes and impacts of industry, business and government activities

ELEMENT OF COMPETENCE – PROFESSIONAL ENGINEER	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. Advanced leadership and management knowledge	<i>means</i> that you comprehend and apply advanced theory-based understanding of commercial, legal and governance fundamentals to predict the effect of <i>management decisions</i>	<ul style="list-style-type: none"> • Develop and apply current research papers to inform and shape perceptions of legal and commercial possibilities to meet [client] needs • apply advanced theory-based knowledge of commercial, policy and governance fundamentals at the forefront of a management practice to the delivery of services, systems and programs • use mathematical, numerical and computational tools pertinent to a scientific approach to management practice to predict service delivery, commercial, environmental and social performance • apply the principles and theories of management practice and mathematics to help make accurate performance predictions, including predicting failure • apply commercial fundamentals and logic to the development and operation of complex financial, commercial service delivery or managerial systems
13. Local leadership and management knowledge	<p><i>means</i> that you acquire and apply knowledge of the local legal and commercial jurisdiction; and</p> <p><i>means</i> that, where appropriate, you apply management knowledge contributed by other people including suppliers, consultants, service deliverers and independent experts</p>	<ul style="list-style-type: none"> • apply accepted local regulations and management practices and locally applied international protocols • take into account local environmental plans, conditions, constraints and opportunities • keep yourself informed about new and emerging technologies, techniques, services, businesses, regulations, management theories and science relevant to your leadership and management • demonstrate the application of local knowledge and practices, including unwritten business knowledge contributed by informed peers and experts knowledgeable in the area of management

ELEMENT OF COMPETENCE – PROFESSIONAL ENGINEER	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
14. Problem analysis	<i>means that you define, investigate and analyse management problems and opportunities</i>	<ul style="list-style-type: none"> • accurately determine the main issues that require addressing in analysing the 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 service, process, system or program • when you identify or are presented with <i>management problems</i>, adopt appropriate research methods to locate previously known solutions to similar problems, including seeking advice or help from informed people • conduct research, investigation and analysis in relation to service, program, process or system • engage in dialogue with appropriate people to reach an agreed understanding of commercial issues for which there are no well-understood and reliable solutions
15. Creativity and innovation	<i>means that you develop creative and innovative solutions to management problems</i>	<ul style="list-style-type: none"> • apply your knowledge of materials and physical and abstract objects to work out how to rearrange them so they perform the required function with the agreed aesthetics, level of performance or properties, taking into account the most effective ways to create value for the sponsors, clients, end users and investors in services, programs, processes or systems • develop concepts to meet requirements and specify, document, build, test, verify, validate, measure and monitor business systems, processes or services • review opportunities in work portfolio for enhancing programs, processes, systems and services, assesses viability and initiate actions • apply the benefits of continuous technical change and innovation to enhance the outcomes delivered

ELEMENT OF COMPETENCE – PROFESSIONAL ENGINEER	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
16. Evaluation	<i>means</i> that you evaluate the outcomes and impacts of industry, business or government activities	<ul style="list-style-type: none"> • evaluate ongoing programs, services and processes to identify and diagnose performance deficiencies or opportunities, impending or actual failures, and propose remedies and solutions • monitor and evaluate programs, services, processes or systems against whole of life criteria (cost, quality, safety, reliability, maintenance, aesthetics, fitness for purpose and social and environmental impact and decommissioning) • evaluate programs, services, processes or systems outcomes against the original specification or design brief • diagnose performance deficiencies, conceive and design remedial measures and predict performance of modified systems, processes, programs or services • evaluate service, program, process or systems outcomes for practicality and maintainability as input to future design improvement • assess and use technical information and statistics correctly to ensure that opportunities are based on sound evidence