

AUSTRALIAN NATIONAL UNIVERSITY
College of Engineering and Computer
Science

R E P O R T
on
Work Experience

by
My Name
Student ID Number ...
Day Month Year

**This Report is submitted in partial fulfilment of the Requirements
for Practical Experience for the BE Degree in the ANU College of
Engineering & Computer Science**

C O N T E N T S

- 1.** Information Letter to Work Experience Employers
- 2.** Summary of practical experience
- 3.** Signed Letter of Offer of Employment
- 4.** Photocopy of Passport Entry and Leaving (Work Experience Obtained Overseas)
- 5.** Signed Letter from employers confirming claims made within Report
- 6.** Technical Report
 - 6.1 The structure of the company
 - 6.2 My position in the company
 - 6.3 Technical description of my job
- 7.** Development of Stage 1 Competency Standards for Professional Engineer
- 8.** Conclusions
- 9.** Reflection of my Work Experience
- 10.** Acknowledgements

Appendix 1. Stage 1 Competency Matrix

Appendix 2. Letter of Declaration from Employer

Appendix 3. Insurance Cover Form

Appendix 4 Feedback Form

Appendix 5. Engineers Australian National Generic Stage 1 Competency Standards



16 August 2017

Work Experience Convenor
Research School of Engineering
College of Engineering and Computer Science
The Australian National University
Acton, ACT, 2601

Dear employer,

Firstly I would like to thank you for offering engineering work experience in your organisation to one of our students. Engineering work experience is offered in the context of Australian National University course ENGN3100. It is the purpose of this letter to provide you with some important information about the course.

Exposure to industry practice is an important aspect of engineering training. Students are expected to work under the supervision of a practising engineer. The roles that students undertake can be quite diverse but generally range from an engineering technologist role to a professional engineer / project manager. Engineering work experience is assessed against the following professional and personal attributes of the IEAUST stage 1 competencies¹

3.1	Ethical conduct and professional accountability.	<input checked="" type="checkbox"/>
3.2	Effective oral and written communication in professional and lay domains.	<input checked="" type="checkbox"/>
3.3	Creative, innovative and pro-active demeanour.	<input type="checkbox"/>
3.4	Professional use and management of information.	<input checked="" type="checkbox"/>
3.5	Orderly management of self, and professional conduct.	<input checked="" type="checkbox"/>
3.6	Effective team membership and team leadership.	<input checked="" type="checkbox"/>

A typical work experience stint lasts 8-12 weeks full-time and students are required to produce a 10-15 page report². Satisfactory completion of this report is a course requirement and is a necessary requirement for fulfillment of the degree.

There are five administrative duties that we kindly ask you to perform.

1. A declaration that the work to be offered meets the above IEAUST requirements.
2. A signed letter of offer to the student on company letterhead as evidence of employment.
3. A declaration that the final report is a true and accurate account of the work done.
4. A feedback form on work performance.
5. If your organisation is not providing insurance cover, a completed University insurance form.

These forms can be found in the ENGN3100 work report template² provided by the student.

Yours sincerely,
Gerard Borg

1 https://cecs.anu.edu.au/professional_skills_mapping/ENGN3100.html

2 https://cecs.anu.edu.au/sites/default/files/2017_engn3100_report_template_and_resources_-_01112017.pdf

IMPORTANT INFORMATION

- The completed Stage 1 competency matrix of Appendix 1 must be included in your report. The competencies claimed in the report should be referred to by their numberings in Appendix 1. (see Section 6).
- The employer must provide a letter of offer to be included in the report (Section 2).
- The letter of Appendix 2 must be signed by your employer and returned to the course convenor **BEFORE** you start employment.
- If you are not covered by your employer's work insurance, then cover can be obtained through the University's work insurance. The University insurance form in Appendix 3 must be completed by you and your employer and signed by the course convenor prior to the commencement of employment. This cover is also available for overseas placements.
- The feedback form of Appendix 4 must be completed by each employer and returned by email to the convenor.
- Overseas students also need to put their prospective employers in contact with the course convenor by either email or telephone before travelling.
- Students should make sure that prospective employers are in possession of the Work Experience Information letter for employers.

WARNING

**REPORTS DISPLAYING OBVIOUS AND/OR
SIGNIFICANT MISCONDUCT, (INCLUDING
BUT NOT LIMITED TO) FRAUD,
COLLUSION OR PLAGIARISM, WILL BE
FORMALLY INVESTIGATED AND
PENALISED UNDER THE ANU ACADEMIC
MISCONDUCT RULES**

2. SUMMARY OF PRACTICAL EXPERIENCE

Period 1

Name of Employer:

Starting date of employment:

Ending date of employment:

Position/job:

Period 2

Name of Employer:

Starting date of employment:

Ending date of employment:

Position/job:

Total number of weeks of experience claimed:

(do not claim more than 12 weeks)

**3. Copy of Signed Letter of Offer of Employment/
placement within host organization
(Original plus Certified English Translations required)**

We require one offer letter for each position you held

4. Photocopy of Passport Entry and Leaving (Work Experience Obtained Overseas Only)

Please clearly indicate by circling and explaining all relevant dates.

MAKE SURE THAT YOU OBTAIN EVIDENCE OF YOUR ENTRIES AND EXITS EVEN IF YOU USE ELECTRONIC PASSPORT CONTROL -

<https://www.border.gov.au/Trav/Ente/Goin/Arrival/Smartgateor-ePassport>

5. LETTER FROM EMPLOYER

(More than one may be necessary! Originals plus Certified English Translations are required)

COMPANY LETTERHEAD

date

Director – Research School of Engineering
College of Engineering and Computer Science
Australian National University
Canberra, ACT 2601

Please fill in each part of this declaration.

1. This is to certify that Mr/Ms/Miss/Mrs/etc worked at <name of company> from(date)..... to(date)..... in a full-time/ part-time capacity and from(date)..... to(date)..... at an average of (e.g. 2.5 days) per week.

2. During the employment his/her job involved
(detailed job description – approx. ½ a page).....

3. This report is a true and accurate account of work actually performed by Mr/Ms/Miss/Mrs/etc

Yours Sincerely,

(the letter must be signed by the supervisor at the place of employment)

(signature)

(Position)

6 THE REPORT

6.1 The structure and operation of the Company (3-4 pages)

- Company's full name, associates, parent or autonomous?
- Company head-quarters full address, telephone, Internet, etc.
- Managerial and administrative structure of the company.
- Company's business/ products, production output, trading partners, markets.
- Company's divisions (if there are any). Division's business/products, etc.
- Name and address of the Head of the Division.
- Company's financial base, is it private or public, is it listed on Stock Exchange?
- Total operation budget, division into business areas.
- Attitude of the company to its work-force, prevailing ethics in the company.

6.2 My position in the Company (1-2 pages)

- Title of my job/ jobs.
- My immediate supervisor, and my position within the structure.
- Responsibility and requirements in my job(s).
- Interaction with other employees.
- Why was the job offered to me?

6.3 Technical description of the Job (5-6 pages)

- What I did (attach summary results as appendix, if relevant).
- What I achieved (attach any drawings, photographs, sketches as appendix, if relevant).
- How did my work relate to Company's business?

7. Development of Stage 1 Competency Standards for Professional Engineer (2-3 pages)

- How my experiences helped me work towards the standards of a professional engineer.
- The standards identified by Engineers Australia are listed on the ENGN3100 WebCT report site
- Which areas of competency were developed, and how.\

PLEASE NUMBER EACH COMPETENCY CLAIMED ACCORDING TO THE NUMBERING SYSTEM OF APPENDIX 1.

8. Conclusions (1 page)

9. Reflection of my Work Experience (1 page)

10. Acknowledgments (as appropriate)

Appendix 1. Stage 1 Competency Matrix

Australian Engineering Competency Standards, Engineers Australia Competencies for Stage 1 Engineering Practitioners

Unit	UNIT Descriptor	Competency Claimed ? [Y/N]	Section or Line or Paragraph numbers where covered in Report	Line-number(s) where covered in Journal
1	KNOWLEDGE AND SKILL BASE			
1.1	Comprehensive, theory based understanding of the underpinning natural and physical sciences and the engineering fundamentals applicable to the engineering discipline.			
1.2	Conceptual understanding of the, mathematics, numerical analysis, statistics, and computer and information sciences which underpin the engineering discipline.			
1.3	In-depth understanding of specialist bodies of knowledge within the engineering discipline.			
1.4	Discernment of knowledge development and research directions within the engineering discipline.			
1.5	Knowledge of contextual factors impacting the engineering discipline.			
1.6	Understanding of the scope, principles, norms, accountabilities and bounds of contemporary engineering practice in the specific discipline.			
2	ENGINEERING APPLICATION ABILITY			
2.1	Application of established engineering methods to complex engineering problem solving.			
2.2	Fluent application of engineering techniques, tools and resources.			
2.3	Application of systematic engineering synthesis and design processes			
2.4	Application of systematic approaches to the conduct and management of engineering projects.			
3	PROFESSIONAL AND PERSONAL ATTRIBUTES			
3.1	Ethical conduct and professional accountability			
3.2	Effective oral and written communication in professional and lay domains			
3.3	Creative, innovative and pro-active demeanour.			
3.4	Professional use and management of information.			
3.5	Orderly management of self, and professional conduct.			
3.6	Effective team membership and team leadership.			

Other Appendices (if appropriate)

(signature of student submitting report)

(date)

Appendix 2. Letter of Declaration from Employer

COMPANY LETTERHEAD






Date

Director – Research School of Engineering
College of Engineering and Computer Science
Australian National University
Canberra, ACT 0200

The aim of engineering work experience is

- I. to expose the student to the workplace and workplace issues (such as human and industrial relations, job organisation, maintenance, safety and environmental issues),
- II. to provide direct insight into professional engineering practice.

This is to certify that while working at(company name)..... under the supervision of accredited engineer(engineer's name)....., the following minimum set of Stage 1 competencies will be manifested in the work performed and in a manner that can be documented by student Mr/Ms/Miss/Mrs/etc(student name).....

3.1	Ethical conduct and professional accountability.	
3.2	Effective oral and written communication in professional and lay domains.	
3.3	Creative, innovative and pro-active demeanour. (NOT ASSESSED)	
3.4	Professional use and management of information.	
3.5	Orderly management of self, and professional conduct.	
3.6	Effective team membership and team leadership.	


Yours Sincerely,

(the letter must be signed by the supervisor at the place of employment)

(signature)

(Position)

Appendix 3. Insurance Cover Form

 <p>Australian National University</p>	<p style="text-align: right;">Insurance Office</p> <p style="text-align: right;">Chancelry Building 10C</p> <p style="text-align: right;">Insurance.office@anu.edu.au</p> <p style="text-align: right;">Enquiries (02) 6125 4257 Facsimile (02) 6125 8797</p>
<p style="text-align: center;">Insurance Cover for Students undertaking practical placement, community placement, work experience and field assignments</p>	

Student Name :			
Student Number :		Phone Number :	
Course / Award :			
Period :/...../..... to/...../.....		

<p style="text-align: center;">To be completed by the Head of Department / Course Convenor / Program Convenor</p>			
<p>I certify that this person is enrolled with the ANU and is required to undertake a practical placement, community placement, work experience or field assignments or conduct a Research Project as a component of an approved ANU course.</p>			
<p>Signature :</p>			
Print Name :		Uni Id :	

Organisation providing supervisor :	
Location of work experience facility or Research Project :	
Work Experience or Research Project supervisor :	
Phone Number :	

Cover

While undertaking approved practical placement, community placement, work experience and field assignments the student is covered by the University's Public Liability and Group Personal Accident Policy or Travel Policy.

Appendix 4. Feedback Form to be filled in by employer

THE STUDENT'S OVERALL PERFORMANCE (Please cross X)

Unsatisfactory	Below Average	Average	Good	Exceptional/ Beyond Expectations

MAJOR STRENGTHS:

RECOMMENDATIONS TO MAKE THE STUDENT BETTER PREPARED FOR THE
WORKPLACE

Appendix 5. ENGINEERS AUSTRALIA NATIONAL GENERIC STAGE 1 COMPETENCY STANDARDS (2011)

As the unified, national competency assessment authority for engineering practice in Australia, Engineers Australia maintains a competency based assessment system for determining fitness for practice at various career stages for Professional Engineers, Engineering Technologists and Engineering Associates. Competency Standards are published as a foundation reference for part of this assessment process. The Stage 1 Competency Standards covering the occupational categories of Professional Engineer, Engineering Technologist and Engineering Associate set out the generic competencies deemed to be essential for an individual to commence practice in the appropriate occupational category. The Standards cover knowledge, skills and engineering application abilities as well as professional skills, values and attitudes, and provide detailed indicators of attainment for each element of competency.

The Stage 1 Competency assessment system is used for the direct assessment of individuals seeking entry to Engineers Australia membership where base qualifications are not recognised under the appropriate Accord. The Stage 1 Competency Standard for the appropriate occupational category provides a benchmark for candidates preparing their Competency Demonstration Report in preparation for assessment.

The Standards, by definition, are also the generic template of targeted graduate outcomes for any engineering education program aimed at delivering graduates fit to commence practice in the associated occupational category. As such the Stage 1 Competency Standards underpin the learning design function undertaken by engineering educators in both the university and vocational sectors.

BACKGROUND

Engineers Australia first documented National Generic Competency Standards for Professional Engineers in 1993. The development work was undertaken under contract from the Commonwealth Government to assist the assessment of migrants with engineering qualifications and experience, and the developers took advice from the education and industry sectors. The Standards covered both Stage 1 (entry level, professional engineering work undertaken under guidance) and Stage 2 (professional autonomy for normal engineering work within the scope of demonstrated competences) for Professional Engineers, and also scoped the corresponding Standards for Engineering Technologists and Engineering Associates.

These standards underwent significant review in 1998 and were republished in 1999 as the National Generic Competency Standards aimed primarily at the assessment of the mature engineer at the Stage 2 level.

In 1996 a national review of engineering education resulted in the report *Changing the Culture: Engineering Education into the Future*. This report focused strongly on defining appropriate outcome capabilities in graduate Professional Engineers and listed *generic attributes* that should be targeted for graduates in this occupational category, irrespective of engineering discipline.

In 1999 the Engineers Australia accreditation system for the assessment of programs in the Professional Engineer category was heavily reviewed by the Accreditation Board and new criteria for accreditation established. In line with directions being taken by other partner signatories to the Washington Accord, Engineers Australia for the first time refocused its accreditation criteria on the key input process and output measures that were seen to impact delivery of graduate outcomes.

In 2003 and 2004 a totally revised Stage 1 Competency Standard set was developed and published with a separate standard for each of the occupational categories of Professional Engineer, Engineering Technologist and Engineering Associate. These new competencies again focused uniquely on the key capabilities deemed to be essential for the commencement of practice in the appropriate occupational category. The new standards were built upon the ten generic competencies that had been originally set down for the Professional Engineer graduate.

In 2005, the Engineers Australia assessment team adopted the newly published Stage 1 Competency Standards as the benchmark reference for applicant preparation of Competency Demonstration reports and for the assessment process itself. These Standards defined 3 Units and 17 Elements of Competency in each occupational category.

At the same time, the accreditation system for assessment of engineering education programs in the Professional Engineer category was also revised to ensure that the accreditation criteria and guidelines were

compatible with the Stage 1 Competency Standard. The revised Accreditation Management System was published in 2004. Since that time companion Accreditation Management Systems have been published for programs in the Engineering Technologist and Engineering Associate categories. The elements of competency represent learning outcomes, and the indicators of attainment provided against each were useful to curriculum designers to ensure adequate coverage and assessment of their degree programs.

2009-2011 STAGE 1 COMPETENCY STANDARDS REVIEW PROJECT

An Australian Learning and Teaching Council funded Review of Engineering Education undertaken by the Australian Council of Engineering Deans in collaboration with Engineers Australia and other stakeholders published its report - *Addressing the Quality and Supply of Engineering Graduates* in 2008. Recommendation 2 of the Review identified the need to review and update the Stage 1 Competency Standards from the viewpoint of setting knowledge, skills and attribute targets for graduate Professional Engineers, Engineering Technologists and Engineering Associates.

Key drivers for this recommendation had been the broad and detailed advice received from stakeholders in Australia as well as the evolution of graduate outcome expectations set by the international engineering community, and expressed by the Education Accords under the International Engineering Alliance (IEA). An additional key influence was the equivalent requirements that are associated with the 'EUR-ACE label', and which are used by the European Network for the Accreditation of Engineering Education in its framework standards for accreditation of engineering education programs in the European Higher Education sector.

A further ALTC-funded project was launched in 2008 to begin the review of the Stage 1 Competency Standards. The theme leaders foreshadowed wide consultation with engineering education leaders (including Associate Deans for Teaching & Learning), graduate employers, and representatives of Engineers Australia's Colleges and committees. The revision process also needed to take into account the Graduate Attributes Exemplar Profiles (IEA, 2009) adopted by the Washington, Sydney and Dublin Accords. The Standards, as revised, are intended to contain sufficient detail to assist curriculum developers to develop programs that equip graduates with the required outcomes, and they are also consistent with the Threshold Learning Outcomes (TLOs) developed by the ALTC Discipline Scholars in Engineering and ICT under the national ALTC Standards and Assessment project which was conducted in parallel, and in close consultation with the Competency Standard review. These TLOs are an aggregation of the outcomes specified by the elements of competency set down by Engineers Australia in its Stage 1 Competency Standard and by the Body of Knowledge definition for the Professional Engineer occupational category set by the Australian Computer Society.

The Competency Standard review project commenced systematic consultation with stakeholders in late 2008. Consultative forums were held from late 2008 through to October of 2010. Two workshops were held with the Associate Deans (Teaching and Learning) and key engineering educators drawn from across Australia. A one-day workshop in Melbourne involved senior industry engineers and engineering managers from more than 20 private and public sector enterprises from Victoria and interstate.

In parallel, input was sought from each of the eight discipline based College Boards of Engineers Australia and the National Committees of Engineering Technologists and Associates. In the first instance these consultations sought comment and/or position statements on the existing Engineers Australia Stage 1 Competency Standards. The workshop outcomes and written submissions were analysed and consolidated as input to the first draft revision of the Competency Standards. This draft was then distributed to all stakeholder groups and individuals for comment and widespread written feedback was received. A final consultation workshop was held in Melbourne in October of 2010 with representatives of all stakeholder groups invited. Further feedback from this workshop informed the final draft of the proposed Competency Standards.

This final draft was endorsed by the Accreditation Board of Engineers Australia and submitted to the Engineers Australia Council at its February 2011 meeting. Council adopted the new Competency Standards, subject to minor editorial changes that arose from discussion. The revised Stage 1 Competency Standard for each occupational category has now been published in final form. The revised Standards will provide the basis for assessment of Stage 1 Competency and an important new benchmark for curriculum design and program accreditation. Although the accreditation system will allow a transition period as university and vocational education institutions adapt graduate outcome specifications and learning design to track delivery of the new generic competencies, it is expected that any new programs developed from 2011 onwards will adopt the new Competency Standards as the foundation reference for an outcomes based educational design process.



STAGE 1 COMPETENCY STANDARD FOR PROFESSIONAL ENGINEER

ROLE DESCRIPTION - THE MATURE, PROFESSIONAL ENGINEER

The following characterises the senior practice role that the mature, Professional Engineer may be expected to fulfil and has been extracted from the role portrayed in the *Engineers Australia - Chartered Status Handbook*.

Professional Engineers are required to take responsibility for engineering projects and programs in the most far-reaching sense. This includes the reliable functioning of all materials, components, sub-systems and technologies used; their integration to form a complete, sustainable and self-consistent system; and all interactions between the technical system and the context within which it functions. The latter includes understanding the requirements of clients, wide ranging stakeholders and of society as a whole; working to optimise social, environmental and economic outcomes over the full lifetime of the engineering product or program; interacting effectively with other disciplines, professions and people; and ensuring that the engineering contribution is properly integrated into the totality of the undertaking. Professional Engineers are responsible for interpreting technological possibilities to society, business and government; and for ensuring as far as possible that policy decisions are properly informed by such possibilities and consequences, and that costs, risks and limitations are properly understood as the desirable outcomes.

Professional Engineers are responsible for bringing knowledge to bear from multiple sources to develop solutions to complex problems and issues, for ensuring that technical and non-technical considerations are properly integrated, and for managing risk as well as sustainability issues. While the outcomes of engineering have physical forms, the work of Professional Engineers is predominantly intellectual in nature. In a technical sense, Professional Engineers are primarily concerned with the advancement of technologies and with the development of new technologies and their applications through innovation, creativity and change. Professional Engineers may conduct research concerned with advancing the science of engineering and with developing new principles and technologies within a broad engineering discipline. Alternatively, they may contribute to continual improvement in the practice of engineering, and in devising and updating the codes and standards that govern it.

Professional Engineers have a particular responsibility for ensuring that all aspects of a project are soundly based in theory and fundamental principle, and for understanding clearly how new developments relate to established practice and experience and to other disciplines with which they may interact. One hallmark of a professional is the capacity to break new ground in an informed, responsible and sustainable fashion.

Professional Engineers may lead or manage teams appropriate to these activities, and may establish their own companies or move into senior management roles in engineering and related enterprises.

STAGE 1 COMPETENCIES

The three Stage 1 Competencies are covered by 16 mandatory Elements of Competency. The Competencies and Elements of Competency represent the profession's expression of the knowledge and skill base, engineering application abilities, and professional skills, values and attitudes that must be demonstrated at the point of entry to practice.

The suggested indicators of attainment in Tables 1, 2 and 3 provide insight to the breadth and depth of ability expected for each element of competency and thus guide the competency demonstration and assessment processes as well as curriculum design. The indicators should not be interpreted as discrete sub-elements of competency mandated for individual audit. Each element of competency must be tested in a holistic sense, and there may well be additional indicator statements that could complement those listed.

STAGE 1 COMPETENCIES and ELEMENTS OF COMPETENCY

1. **KNOWLEDGE AND SKILL BASE**

- 1.1. **Comprehensive, theory based understanding** of the underpinning natural and physical sciences and the engineering fundamentals applicable to the engineering discipline.
- 1.2. **Conceptual understanding** of the, mathematics, numerical analysis, statistics, and computer and information sciences which underpin the engineering discipline.
- 1.3. **In-depth understanding** of specialist bodies of knowledge within the engineering discipline.
- 1.4. **Discernment** of knowledge development and research directions within the engineering discipline.
- 1.5. **Knowledge** of contextual factors impacting the engineering discipline.
- 1.6. **Understanding** of the scope, principles, norms, accountabilities and bounds of contemporary engineering practice in the specific discipline.

2. **ENGINEERING APPLICATION ABILITY**

- 2.1. **Application** of established engineering methods to complex engineering problem solving.
- 2.2. **Fluent application** of engineering techniques, tools and resources.
- 2.3. **Application** of systematic engineering synthesis and design processes.
- 2.4. **Application** of systematic approaches to the conduct and management of engineering projects.

3. **PROFESSIONAL AND PERSONAL ATTRIBUTES**

- 3.1. Ethical conduct and professional accountability
- 3.2. Effective oral and written communication in professional and lay domains.
- 3.3. Creative, innovative and pro-active demeanour.
- 3.4. Professional use and management of information.
- 3.5. Orderly management of self, and professional conduct.
- 3.6. Effective team membership and team leadership.

Table 1 Knowledge and Skill Base: Elements and Indicators

ELEMENT OF COMPETENCY	INDICATORS OF ATTAINMENT
1.1 Comprehensive, theory based understanding of the underpinning natural and physical sciences and the engineering fundamentals applicable to the engineering discipline.	a) Engages with the engineering discipline at a phenomenological level, applying sciences and engineering fundamentals to systematic investigation, interpretation, analysis and innovative solution of <i>complex</i> problems and broader aspects of engineering practice.
1.2 Conceptual understanding of the, mathematics, numerical analysis, statistics, and computer and information sciences which underpin the engineering discipline.	a) Develops and fluently applies relevant investigation analysis, interpretation, assessment, characterisation, prediction, evaluation, modelling, decision making, measurement, evaluation, knowledge management and communication tools and techniques pertinent to the engineering discipline.
1.3 In depth understanding of specialist bodies of knowledge within the engineering discipline.	a) Proficiently applies advanced technical knowledge and skills in at least one specialist practice domain of the engineering discipline.
1.4 Discernment of knowledge development and research directions within the engineering discipline.	<p>a) Identifies and critically appraises current developments, advanced technologies, emerging issues and interdisciplinary linkages in at least one specialist practice domain of the engineering discipline.</p> <p>b) Interprets and applies selected research literature to inform engineering application in at least one specialist domain of the engineering discipline.</p>
1.5 Knowledge of contextual factors impacting the engineering discipline.	<p>a) Identifies and understands the interactions between engineering systems and people in the social, cultural, environmental, commercial, legal and political contexts in which they operate, including both the positive role of engineering in sustainable development and the potentially adverse impacts of engineering activity in the engineering discipline.</p> <p>b) Is aware of the founding principles of human factors relevant to the engineering discipline.</p> <p>c) Is aware of the fundamentals of business and enterprise management.</p> <p>d) Identifies the structure, roles and capabilities of the engineering workforce.</p> <p>e) Appreciates the issues associated with international engineering practice and global operating contexts.</p>
1.6 Understanding of the scope, principles, norms, accountabilities and bounds of contemporary engineering practice in the engineering discipline.	<p>a) Applies systematic principles of engineering design relevant to the engineering discipline.</p> <p>b) Appreciates the basis and relevance of standards and codes of practice, as well as legislative and statutory requirements applicable to the engineering discipline.</p> <p>c) Appreciates the principles of safety engineering, risk management and the health and safety responsibilities of the professional engineer, including legislative requirements applicable to the engineering discipline.</p> <p>d) Appreciates the social, environmental and economic principles of sustainable engineering practice.</p> <p>e) Understands the fundamental principles of engineering project management as a basis for planning, organising and managing resources.</p> <p>f) Appreciates the formal structures and methodologies of systems engineering as a holistic basis for managing complexity and sustainability in engineering practice.</p>

Notes:

1. 'engineering discipline' means the broad branch of engineering (civil, electrical, mechanical, etc.) as typically represented by the Engineers Australia Colleges.
2. 'specialist practice domain' means the specific area of knowledge and practice within an engineering discipline, such as geotechnics, power systems, manufacturing, etc.

Table 2 Engineering Application Ability: Elements and Indicators

ELEMENT OF COMPETENCY	INDICATORS OF ATTAINMENT	
<p>2.1 Application of established engineering methods to <i>complex</i> engineering problem solving.</p>	<ul style="list-style-type: none"> a) Identifies, discerns and characterises salient issues, determines and analyses causes and effects, justifies and applies appropriate simplifying assumptions, predicts performance and behaviour, synthesises solution strategies and develops substantiated conclusions. b) Ensures that all aspects of an engineering activity are soundly based on fundamental principles - by diagnosing, and taking appropriate action with data, calculations, results, proposals, processes, practices, and documented information that may be ill-founded, illogical, erroneous, unreliable or unrealistic. c) Competently addresses engineering problems involving uncertainty, ambiguity, imprecise information and wide-ranging and sometimes conflicting technical and non-technical factors. d) Partitions problems, processes or systems into manageable elements for the purposes of analysis, modelling or design and then re-combines to form a whole, with the integrity and performance of the overall system as the paramount consideration. e) Conceptualises alternative engineering approaches and evaluates potential outcomes against appropriate criteria to justify an optimal solution choice. f) Critically reviews and applies relevant standards and codes of practice underpinning the engineering discipline and nominated specialisations. g) Identifies, quantifies, mitigates and manages technical, health, environmental, safety and other contextual risks associated with engineering application in the designated engineering discipline. h) Interprets and ensures compliance with relevant legislative and statutory requirements applicable to the engineering discipline. i) Investigates complex problems using research-based knowledge and research methods. 	
<p>2.2 Fluent application of engineering techniques, tools and resources.</p>	<ul style="list-style-type: none"> a) Proficiently identifies, selects and applies the materials, components, devices, systems, processes, resources, plant and equipment relevant to the engineering discipline. b) Constructs or selects and applies from a qualitative description of a phenomenon, process, system, component or device a mathematical, physical or computational model based on fundamental scientific principles and justifiable simplifying assumptions. c) Determines properties, performance, safe working limits, failure modes, and other inherent parameters of materials, components and systems relevant to the engineering discipline. d) Applies a wide range of engineering tools for analysis, simulation, visualisation, synthesis and design, including assessing the accuracy and limitations of such tools, and validation of their results. e) Applies formal systems engineering methods to address the planning and execution of complex, problem solving and engineering projects. f) Designs and conducts experiments, analyses and interprets result data and formulates reliable conclusions. g) Analyses sources of error in applied models and experiments; eliminates, minimises or compensates for such errors; quantifies significance of errors to any conclusions drawn. h) Safely applies laboratory, test and experimental procedures appropriate to the engineering discipline. i) Understands the need for systematic management of the acquisition, commissioning, operation, upgrade, monitoring and maintenance of engineering plant, facilities, equipment and systems. j) Understands the role of quality management systems, tools and processes within a culture of continuous improvement. 	

Table 2 (cont.) Engineering Application Ability: Elements and Indicators

ELEMENT OF COMPETENCY	INDICATORS OF ATTAINMENT
<p>2.3 Application of systematic engineering synthesis and design processes.</p>	<ul style="list-style-type: none"> a) Proficiently applies technical knowledge and open ended problem solving skills as well as appropriate tools and resources to design components, elements, systems, plant, facilities and/or processes to satisfy user requirements. b) Addresses broad contextual constraints such as social, cultural, environmental, commercial, legal political and human factors, as well as health, safety and sustainability imperatives as an integral part of the design process. c) Executes and leads a whole systems design cycle approach including tasks such as: <ul style="list-style-type: none"> - determining client requirements and identifying the impact of relevant contextual factors, including business planning and costing targets; - systematically addressing sustainability criteria; - working within projected development, production and implementation constraints; - eliciting, scoping and documenting the required outcomes of the design task and defining acceptance criteria; - identifying assessing and managing technical, health and safety risks integral to the design process; - writing engineering specifications, that fully satisfy the formal requirements; - ensuring compliance with essential engineering standards and codes of practice; - partitioning the design task into appropriate modular, functional elements; that can be separately addressed and subsequently integrated through defined interfaces; - identifying and analysing possible design approaches and justifying an optimal approach; - developing and completing the design using appropriate engineering principles, tools, and processes; - integrating functional elements to form a coherent design solution; - quantifying the materials, components, systems, equipment, facilities, engineering resources and operating arrangements needed for implementation of the solution; - checking the design solution for each element and the integrated system against the engineering specifications; - devising and documenting tests that will verify performance of the elements and the integrated realisation; - prototyping/implementing the design solution and verifying performance against specification; - documenting, commissioning and reporting the design outcome. d) Is aware of the accountabilities of the professional engineer in relation to the 'design authority' role.
<p>2.4 Application of systematic approaches to the conduct and management of engineering projects.</p>	<ul style="list-style-type: none"> a) Contributes to and/or manages <i>complex</i> engineering project activity, as a member and/or as leader of an engineering team. b) Seeks out the requirements and associated resources and realistically assesses the scope, dimensions, scale of effort and indicative costs of a <i>complex</i> engineering project. c) Accommodates relevant contextual issues into all phases of engineering project work, including the fundamentals of business planning and financial management d) Proficiently applies basic systems engineering and/or project management tools and processes to the planning and execution of project work, targeting the delivery of a significant outcome to a professional standard. e) Is aware of the need to plan and quantify performance over the full life-cycle of a project, managing engineering performance within the overall implementation context. f) Demonstrates commitment to sustainable engineering practices and the achievement of sustainable outcomes in all facets of engineering project work.

Table 3 Professional and Personal Attributes: Elements and Indicators

ELEMENT OF COMPETENCY	INDICATORS OF ATTAINMENT
3.1 Ethical conduct and professional accountability	<ul style="list-style-type: none"> a) Demonstrates commitment to uphold the Engineers Australia - Code of Ethics, and established norms of professional conduct pertinent to the engineering discipline. b) Understands the need for 'due-diligence' in certification, compliance and risk management processes. c) Understands the accountabilities of the professional engineer and the broader engineering team for the safety of other people and for protection of the environment. d) Is aware of the fundamental principles of intellectual property rights and protection.
3.2 Effective oral and written communication in professional and lay domains.	<ul style="list-style-type: none"> a) Is proficient in listening, speaking, reading and writing English, including: <ul style="list-style-type: none"> - comprehending critically and fairly the viewpoints of others; - expressing information effectively and succinctly, issuing instruction, engaging in discussion, presenting arguments and justification, debating and negotiating - to technical and non-technical audiences and using textual, diagrammatic, pictorial and graphical media best suited to the context; - representing an engineering position, or the engineering profession at large to the broader community; - appreciating the impact of body language, personal behaviour and other non-verbal communication processes, as well as the fundamentals of human social behaviour and their cross-cultural differences. b) Prepares high quality engineering documents such as progress and project reports, reports of investigations and feasibility studies, proposals, specifications, design records, drawings, technical descriptions and presentations pertinent to the engineering discipline.
3.3 Creative, innovative and pro-active demeanour.	<ul style="list-style-type: none"> a) Applies creative approaches to identify and develop alternative concepts, solutions and procedures, appropriately challenges engineering practices from technical and non-technical viewpoints; identifies new technological opportunities. b) Seeks out new developments in the engineering discipline and specialisations and applies fundamental knowledge and systematic processes to evaluate and report potential. c) Is aware of broader fields of science, engineering, technology and commerce from which new ideas and interfaces may be drawn and readily engages with professionals from these fields to exchange ideas.
3.4 Professional use and management of information.	<ul style="list-style-type: none"> a) Is proficient in locating and utilising information - including accessing, systematically searching, analysing, evaluating and referencing relevant published works and data; is proficient in the use of indexes, bibliographic databases and other search facilities. b) Critically assesses the accuracy, reliability and authenticity of information. c) Is aware of common document identification, tracking and control procedures.
3.5 Orderly management of self, and professional conduct.	<ul style="list-style-type: none"> a) Demonstrates commitment to critical self-review and performance evaluation against appropriate criteria as a primary means of tracking personal development needs and achievements. b) Understands the importance of being a member of a professional and intellectual community, learning from its knowledge and standards, and contributing to their maintenance and advancement. c) Demonstrates commitment to life-long learning and professional development. d) Manages time and processes effectively, prioritises competing demands to achieve personal, career and organisational goals and objectives. e) Thinks critically and applies an appropriate balance of logic and intellectual criteria to analysis, judgment and decision making. f) Presents a professional image in all circumstances, including relations with clients, stakeholders, as well as with professional and technical colleagues across wide ranging disciplines.
3.6 Effective team membership and team leadership.	<ul style="list-style-type: none"> a) Understands the fundamentals of team dynamics and leadership. b) Functions as an effective member or leader of diverse engineering teams, including those with multi- level, multi-disciplinary and multi-cultural dimensions. c) Earns the trust and confidence of colleagues through competent and timely completion of tasks. d) Recognises the value of alternative and diverse viewpoints, scholarly advice and the importance of professional networking. e) Confidently pursues and discerns expert assistance and professional advice. f) Takes initiative and fulfils the leadership role whilst respecting the agreed roles of others