ECSA

ENGINEERING COUNCIL OF SOUTH AFRICA

An Effective Regulator Assuring Engineering Excellence

Competency Standard for Registration in Professional Categories as Professional Engineer, Technologist and Technician

R-02-STA-PE/PT/PN

Revision 3: 10 July 2023

ENGINEERING COUNCIL OF SOUTH AFRICA
Tel: 011 6079500 | Fax: 011 6229295
Email: engineer@ecsa.co.za | Website: www.ecsa.co.za

TABLE OF CONTENTS

TABLES

DEFINITIONS

Benchmark qualification: An ECSA accredited engineering qualification as set out in the relevant Qualification Standard. For a list of ECSA accredited qualifications meeting the educational requirements, refer to document **E-20-PE/PT/PN**.

Competency area: The performance area in which all the outcomes can be demonstrated at the level prescribed by the specific technology in an integrated manner.

Competency indicator: The typifying guide to evidence indicating competence that is not normative.

Continuing professional development: The systematic maintenance, improvement and broadening of knowledge and skills, and the development of personal qualities necessary for the execution of professional and engineering duties throughout an engineering practitioner's career.

Engineering problem: A problematic situation that is amenable to analysis and solution using engineering science and methods.

Engineering science: A body of knowledge based on the natural sciences and using a mathematical formulation, where necessary, that extends knowledge and develops models and methods to support its application, to solve problems and to provide the knowledge base for engineering specialisations.

Ill-posed problem: A problem for which the requirements are not fully defined or may be defined erroneously by the requesting party.

Integrated performance: The overall satisfactory outcome of an activity, which requires several outcomes to be satisfactorily attained. For example, a design requires analysis, synthesis, analysis of impacts, checking of regulatory conformance and judgement in decisions.

Level descriptor: A measure of performance demands at which outcomes must be demonstrated.

Management of engineering works or activities: Management of the co-ordinated activities that are required.

Outcome: A statement of the performance criteria that a person must demonstrate to be judged competent at the professional level.

Practice area: A generally recognised or distinctive area of knowledge and expertise developed by an engineering practitioner through the path of education, training and experience followed.

Range statement: The required extent of or limitations on expected performance stated in terms of situations and circumstances in which outcomes are to be demonstrated.

ABBREVIATIONS

AIET	Agreement for International Engineering Technicians
DoR	Degree of responsibility
DA	Dublin Accord
IETA	International Engineering Technologist Agreement
IPEA	International Professional Engineers Agreement
PE	Professional Engineer
PN	Professional Engineering Technician
PT	Professional Engineering Technologist
SA	Sydney Accord
WA	Washington Accord

BACKGROUND

The illustration below defines the documents that comprise the Engineering Council of South Africa (ECSA) system for registration in professional categories. The illustration also locates the current document.

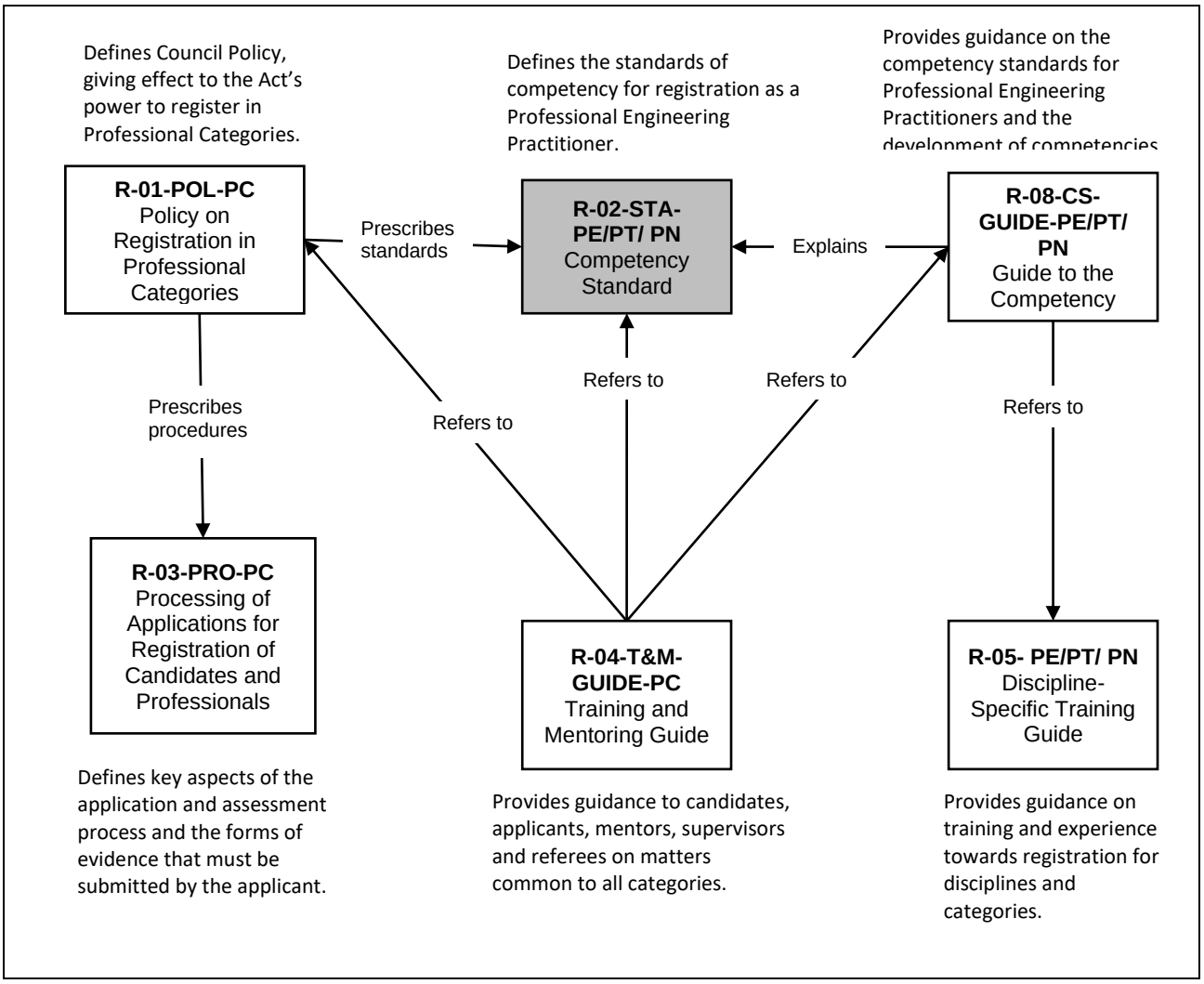

Figure 1: Documents defining the ECSA registration system

1. PURPOSE OF THIS STANDARD

This Competency Standard defines the competencies required for registration across ECSA's categories of professional registrations: Professional Engineer, Professional Engineering Technologist and Professional Engineering Technician.

2. POLICY STATEMENT

The Competency Standards for professional registration are governed by the Policy on Registration of Professional Categories.

3. APPLICABLE LEGISLATIVE FRAMEWORK

The Engineering Profession Act, 46 of 2000 stipulates that the Council may, subject to this Act:

(a) consider and decide on any application for registration
(b) prescribe the period of validity of the registration of a registered person
(c) keep a register of registered persons and decide on:

(i) the form of certificates and the register to be kept
(ii) the maintenance of the register or issuing of certificates
(iii) the reviewing of the register and the manner in which alterations thereto may be effected.

4. NATIONAL AND INTERNATIONAL COMPLIANCE

ECSA is internationally recognised under the auspices of the International Engineering Alliance (IEA) via educational accords and competency agreements as follows:

Educational accords:

- Washington Accord (WA)
- Sydney Accord (SA)
- Dublin Accord (DA)

Competency agreements:

- International Professional Engineers Agreement (IPEA)
- International Engineering Technologist Agreement (IETA)
- Agreement for International Engineering Technicians (AIET)

5. POLICY PROVISIONS

5.1 Introduction to competence

In general, competence is defined as the possession of the necessary knowledge and training and experience to perform the activities within the respective professional category to the standards expected in independent employment or practice.

The knowledge component of competency consists of knowledge from the engineering education process and knowledge that is subsequently acquired during specialised engineering-related activities.

The training and experience component is defined by a set of assessable outcomes, whereby competence must be demonstrated: 1) within applicable engineering activities, 2) by the integrated performance of outcomes, 3) at the level defined for each outcome.

Thus, competence as defined for the purpose of this document is detailed in two categories:

- Knowledge component
- Training and experience component, which is deeply integrated with degree of responsibility (DoR).

5.2 Degree of responsibility

The DoR at which a Candidate operates needs to be given specific consideration in conjunction with the demonstration of competence. While the aspect of DoR is detailed elsewhere, such as in the relevant Training and Mentoring Guide, emphasis is placed on the importance of DoR; as such, Table 1 summarises the degrees of responsibilities from A to E.

Together with the educational and experiential requirements set out in this document, emphasis should be placed on the achievement of the "performing" degree of responsibility "E", which is a requirement for each category of registration.

Table 1: Summary of degree of responsibility

DoR	Nature of work	Responsibility	Level of support
A Being exposed	Undergoes induction, observes processes and work of competent practitioners.	No responsibility, except to pay attention.	Mentor explains challenges and forms of solution.
B Assisting	Performs specific processes under close supervision.	Limited responsibility for work output.	Supervisor/Mentor coaches, offers feedback.
C Participating	Performs specific processes as directed with limited supervision.	Full responsibility for supervised work.	Supervisor progressively reduces support.
D Contributing	Performs specific work with detailed approval of work outputs.	Full responsibility to supervisor for quality of work.	Candidate articulates own reasoning and compares it with that of supervisor.
E Performing	Works in a team without supervision, recommends work outputs.	Level of responsibility to supervisor is appropriate to a registered person, i.e., they are responsible but not accountable.	Candidate takes on problem solving without support; at most limited guidance.

5.3 Competency Indicators

The competency indicators referenced in this document pertain to:

- the level of an engineering problem
- the level of an engineering activity.

These indicators are important in understanding what is expected of a Candidate to achieve satisfactory demonstration of competence, with the specific characteristics outlined in Section 7.

5.4 Outcome Groups

The defined outcomes are combined into five groups as follows:

- GROUP A: Engineering Problem Solving
- GROUP B: Managing Engineering Activities
- GROUP C: Risk and Impact Mitigation
- GROUP D: Act Ethically, Exercise Judgment and Take Responsibility
- GROUP E: Initial Professional Development.

5.5 Competence: Knowledge component

The criteria and processes for recognition of education qualifications for professional categories as defined by ECSA are detailed in document **E-17-PRO**, while the Registration Policy document (**R-01-POL-PC**) sets out the minimum requirements for registration in the respective categories.

5.6 Competence: Training and experience component

Table 2 provides an overview of the benchmark educational and knowledge components for the respective registration categories and the Training and Experience requirements for each category of registration in conjunction with the corresponding level descriptor. The subsequent section provides more detail for each registration category.

Table 2: Summary of qualification benchmarks

Category of registration	Qualification (benchmark)	Qualification duration (benchmark)	Training & experience	Level descriptor
Professional Engineer Pr Eng	BSc (Eng) BEng	4 years	3 years	Solving *complex engineering problems* and performing *complex engineering activities*
Professional Engineering Technologist Pr Tech Eng	BEng Tech	3 years	3 years	Solving *broadly defined engineering problems* and performing *broadly defined engineering activities*
	NDip + BTech (Eng)	4 years	3 years	
	Dip Eng + Adv Dip Eng	4 years	3 years	

Category of registration	Qualification (benchmark)	Qualification duration (benchmark)	Training & experience	Level descriptor
Professional Engineering Technician Pr Techni Eng	Dip Eng NDip (Eng)	3 years	3 years	Solving *well-defined engineering problems* and performing *well-defined engineering activities*
Note: *Academic programmes must be accredited, recognised or evaluated as substantially equivalent, with individual assessments where required.*				

Note: Applicants who obtain benchmark qualification after meeting the required experience in the relevant category can apply for professional registration.

6. COMPETENCY STANDARDS

6.1 Professional Engineer

Outcomes that demonstrate competency

Competence is demonstrated in an integrated manner in a workplace context by satisfying each of the following outcomes.

Outcome 1: Define, investigate and analyse *complex engineering problems*.

Competency Indicators: The definition, investigation and analysis of *complex engineering problems* is typified by:

- defining the engineering problems and procedures for solving the problems
- investigating and evaluating pertinent information and identifying systems and sub-systems of complex problems including collecting, organising and evaluating information from all applicable sources including in-situ investigations where appropriate
- analysing relevant assumptions, inputs and required outputs of a *complex engineering problem*.

Range statement: The *complex engineering problem* may be a design requirement, an applied research and development requirement or a problematic situation in an existing component, system or process.

Outcome 2: Design or develop solutions to *complex engineering problems*.

Competency indicators: Synthesis and working systematically in the development of solutions to a *complex engineering problem* is typified by:

- designing or developing solutions to *complex engineering problems* using appropriate theory and information technologies while checking impacts, sustainability and stakeholder views
- systematically synthesising solutions and providing alternatives by making use of first or fundamental principles within unfamiliar or previously encountered techniques and testing the validity and reasonability of assumptions, correlating with requirements and considering the far-reaching impacts and costs
- evaluating the final solution and developing documentation and an integrated implementation plan.

Range statement: The solution is amenable to widely applied principles, sound and testable assumptions, underpinned by the utilisation of requisite advanced principles relevant to the problem, being cognisant of impacts and the need for sustainability.

Outcome 3: Comprehend and apply advanced and local knowledge of the widely applied principles underpinning good practice that is specific to the jurisdiction in which the Engineer practices.

Competency indicators: Competence in applying relevant knowledge to *complex engineering problems* is typified by:

- stating what fundamental engineering principles, practices, sound testable assumptions or previously encountered techniques, including the application of NQF 8 theory are applied in the practice area
- indicating a working knowledge of interacting disciplines (engineering and other) to underpin teamwork
- demonstrating knowledge and application of engineering standards, codes of practice, legislation, regulations and finance in the practice area.

Range statement: In-depth specialist knowledge in the practice area that supports a fundamentals-based, first-principles, analytical approach. This is supplemented by legal, regulatory and locally relevant knowledge.

Outcome 4: Manage part or all of one or more *complex engineering activities*.

Competency indicators: The display of personal and work process management abilities in the competence area is typified by:

- managing self, people, work priorities, processes and resources when performing complex engineering activities
- planning, organising, leading and controlling complex engineering activities
- managing contracts and other agreements and the ability to establish and maintain professional and business relationships.

Range statement: Management of *complex engineering activities* is directed at achieving results as a member or leader of a team by planning and harnessing people, resources, processes, systems, money and contracts or agreements.

Outcome 5: Communicate clearly using multiple media and collaborate inclusively with a broad range of stakeholders in the course of engineering activities.

Competency indicators: Effective and clear communication is typified by:

- The ability to write clear, concise and effective technical, legal and editorially correct documentation.
- The ability to issue clear and concise instructions and/or guidance being cognisant of the audience and various skills levels.
- The ability to execute oral presentations using structure, style, language, visual aids and supporting documents appropriate to the audience and the purpose.

Range statement: Communication with respect to *complex engineering problems* relates to the technical aspects and the wider impacts of professional work. The audience includes superiors, peers, subordinates, implementing teams, other disciplines, clients and stakeholders. Appropriate modes of communication must be selected.

Outcome 6: Recognise the reasonably foreseeable economic, social, cultural, and environmental effects of *complex engineering activities* seeking to achieve sustainability.

Competency indicators: Competence in this outcome is typified by:

- the ability to identify interested and affected parties and their expectations with regard to technical, sociocultural and environmental effects, while considering the economics and long-term sustainability of the *complex engineering activities*
- measures taken to mitigate the negative effects of *complex engineering activities*.

Range statement: The impacts of *complex engineering activities* must be considered over the project life cycle paying due regard to the far-reaching economic, social and cultural effects, including the protection of the environment and the need for sustainability.

Outcome 7: Meet all legal and regulatory requirements and protect the health and safety of persons during all *complex engineering activities*.

Competency indicators: Competence in this outcome is typified by:

- identifying applicable legal, regulatory, health and safety regulations requirements and standards for the *complex engineering activity*
- applying health and safety regulations and ensuring the safety of all affected persons through the use of safe and sustainable materials, components, processes and systems
- identifying risks and risk management strategies.

Range statement: The impacts of *complex engineering activities* must be considered over the project life cycle paying attention to health and safety, and legal and regulatory requirements.

Outcome 8: Conduct engineering activities ethically.

Competency indicators: Competence in this outcome is typified by:

- knowledge and compliance with the ECSA Code of Conduct for registered persons

- the identification of ethical problems and affected parties, and a systematic approach to resolving the issues.

Range statement: Ethical behaviour involves the comprehension and application of professional ethics, responsibilities and norms of engineering practice within one's own limits of competence.

Outcome 9: Exercise sound judgement by evaluating the outcomes, impacts and alternatives in the course of *complex engineering activities*.

Competency indicators: For *complex engineering activities,* judgement is typified by:

- developing options and final solutions or approaches that consider impacts, interrelationships with other disciplines, time, cost and other wider constraints, including the absence of full evidence.
- taking a holistic view of the solution while considering risks, their consequences and the implications for stakeholders and other affected parties.

Range statement: Judgement is expected in considering the interactions between conflicting technical, engineering, social or other issues and their far-reaching impact on affected parties in making recommendations.

Outcome 10: Be responsible for making decisions on part or all of *complex engineering activities*.

Competency indicators: Competence in responsible decision-making is typified by:

- systematic gathering of related information and checking of facts and inputs required for the decision-making process
- making the final decision, based on knowledge, past experience and seeking advice on matters falling outside the applicant's education and experience
- recording the decision-making process and the reasons for the final decision
- taking responsibility and being prepared to be held accountable for far-reaching and significant consequences (whether positive or negative).

Range statement: Responsibility exercised for outcomes of significant parts of one or more *complex engineering activities*.

Outcome 11: Undertake sufficient professional development activities to maintain, extend competence and enhance the ability to adapt to emerging technologies and the ever-changing nature of work.

Competency indicators: Competence in self-development is typified by:

- explaining awareness and a strategy to independently enhance professional development
- evidence of self-development in chosen and new areas of expertise and personal development.

Range statement: Professional development involves taking ownership, and independently planning, selecting, undertaking and recording appropriate activities to extend competence.

6.2 Professional Engineering Technologist

Outcomes that demonstrate competency

Competence is demonstrated in an integrated manner in a workplace context by satisfying each of the following outcomes.

Outcome 1: Define, investigate and analyse *broadly defined engineering problems*.

Competency indicators: The definition, investigation and analysis of *broadly defined engineering problems* is typified by:

- performing or contributing to defining *broadly defined engineering problems*, thus leading to an agreed definition of the problems to be solved
- investigating or contributing to investigating engineering problems, including collecting, organising and evaluating information from all applicable sources including in-situ investigations where appropriate
- performing or contributing to analysing engineering problems, using conceptualisation, justified assumptions, limitations and evaluation of results.

Range statement: The *broadly defined engineering problem* may be a design requirement, an applied research and development requirement or a problematic situation in an existing component, system or process.

Outcome 2: Design or develop solutions to *broadly defined engineering problems*.

Competency indicators: Synthesis and working systematically in the development of solutions to a *broadly defined engineering problem* is typified by:

- designing or developing solutions to *broadly defined engineering problems* using appropriate theory and information technologies while checking impacts, sustainability and stakeholder views
- systematically synthesising solutions and providing alternatives by analysing designs, correlating with requirements and considering the wide-ranging impacts and costs
- creating detailed specification requirements and designing documentation for implementation to the satisfaction of the client.

Range Statement: The solution is amenable to widely accepted methods, techniques or procedures, being cognisant of impacts and the need for sustainability.

Outcome 3: Comprehend and apply the knowledge embodied in widely accepted and applied engineering procedures, processes, systems and methodologies that is specific to the jurisdiction in which the Engineering Technologist practices.

Competency indicators: Competence in applying relevant knowledge to *broadly defined engineering problems* is typified by:

- stating what engineering principles, practices, procedures, methodologies and technologies, including the application of NQF 7 theory are applied in the practice area
- indicating a working knowledge of areas of practice that interact with the practice area to underpin teamwork
- demonstrating knowledge and application of engineering standards, codes of practice, legislation, regulations and finance in the practice area.

Range statement: Technological knowledge that is well-established and applicable to the practice area. This knowledge is supplemented by legal,

regulatory and locally relevant knowledge. Emerging technologies are adopted from the formulations of others.

Outcome 4: Manage part or all of one or more *broadly defined engineering activities*.

Competency Indicators: The display of personal and work process management abilities in the competence area is typified by:

- managing self, people, work priorities, processes and resources when performing *broadly defined engineering activities*
- planning, organising, leading and controlling *broadly defined engineering activities*
- managing contracts and other agreements and the ability to establish and maintain professional and business relationships.

Range statement: Management of *broadly defined engineering activities* is directed at achieving results as a member or leader of a team by planning and harnessing people, resources, processes, systems, money and contracts or agreements.

Outcome 5: Communicate clearly using multiple mediums and collaborate inclusively with a broad range of stakeholders in the course of engineering activities.

Competency indicators: Effective and clear communication is typified by:

- the ability to write clear, concise and effective technical, legal and editorially correct documentation
- the ability to issue clear and concise instructions and/or guidance being cognisant of the audience and various skills levels
- The ability to execute oral presentations using structure, style, language, visual aids and supporting documents appropriate to the audience and the purpose.

Range statement: Communication with respect to *broadly defined engineering problems* relates to the technical aspects and the wider impacts of professional work. The audience includes superiors, peers, subordinates, implementing teams, other disciplines, clients and stakeholders. Appropriate modes of communication must be selected.

Outcome 6: Recognise the reasonably foreseeable economic, social, cultural and environmental effects of *broadly defined engineering activities* seeking to achieve sustainability.

Competency indicators: Competence in this outcome is typified by:

- the ability to identify interested and affected parties and their expectations with regard to technical, sociocultural and environmental effects, while considering the economics and long-term sustainability of the *broadly defined engineering activities*
- measures taken to mitigate the negative effects of *broadly defined engineering activities*.

Range statement: The impacts of *broadly defined engineering activities* must be considered over the project life cycle paying due regard to the wide-ranging economic, social and cultural effects, including the protection of the environment and the need for sustainability.

Outcome 7: Meet all legal and regulatory requirements and protect the health and safety of persons during all *broadly defined engineering activities*.

Competency indicators: Competence in this outcome is typified by:

- identifying applicable legal, regulatory, health and safety regulations requirements and standards for the *broadly defined engineering activity*
- stating circumstances in which the applicant assisted in or demonstrated awareness regarding health and safety regulations and ensuring the safety of all affected persons through the use of safe and sustainable materials, components, processes and systems
- identifying risks and risk management strategies.

Range statement: The impacts of *broadly defined engineering activities* must be considered over the project life cycle paying attention to health and safety, and legal and regulatory requirements.

Outcome 8: Conduct engineering activities ethically.

Competency indicators: Competence in this outcome is typified by:

- knowledge and compliance with the ECSA Code of Conduct for registered persons

- the identification of ethical problems and affected parties, and how the best solution to resolve the problem is selected.

Range statement: Ethical behaviour involves the comprehension and application of professional ethics, responsibilities and norms of engineering practice within one's own limits of competence.

Outcome 9: Exercise sound judgement by evaluating the outcomes, impacts and alternatives in the course of *broadly defined engineering activities*.

Competency Indicators: For *broadly defined engineering activities,* judgement is typified by:

- developing options and final solutions or approaches, which consider impacts, interrelationships with other disciplines, time, cost and other constraints, including the absence of full evidence
- taking a wide-ranging view of the solution while considering risks, their consequences and the implications for stakeholders and affected parties.

Range statement: Judgement is expected in considering the interactions between technical, engineering, social or other issues and their wide-ranging impact on affected parties in making recommendations.

Outcome 10: Be responsible for making decisions on part or all of *broadly defined engineering activities*.

Competency indicators: Competence in responsible decision-making is typified by:

- systematic gathering of related information and checking of facts and inputs required for the decision-making process
- making the final decision, based on knowledge, past experience and seeking advice on matters falling outside the applicant's education and experience
- keeping record of the decision-making process and the reasons for the final decision
- taking responsibility and being prepared to be held accountable for far-reaching and significant consequences (whether positive or negative).

Range statement: Responsibility exercised for outcomes of significant parts of one or more *broadly defined engineering activities*.

Outcome 11: Undertake sufficient professional development activities to maintain, extend competence and enhance the ability to adapt to emerging technologies and the ever-changing nature of work.

Competency indicators: Competence in self-development is typified by:

- explaining awareness and a strategy to independently enhance professional development
- evidence of self-development in chosen and new areas of expertise and personal development.

Range statement: Professional development involves taking ownership, and independently planning, selecting, undertaking and recording appropriate activities to extend competence.

6.3 Professional Engineering Technician

Outcomes that demonstrate competency

Competence is demonstrated in an integrated manner in a workplace context by satisfying each of the following outcomes.

Outcome 1: Define, investigate and analyse *well-defined engineering problems*.

Competency indicators: The definition, investigation and analysis of *well-defined engineering problems* is typified by:

- interpreting received work instructions, checking with the client or supervisor that the interpretation is correct
- collecting and organising clarifying data from all applicable sources including in-situ investigations where appropriate
- analysing, interpreting and evaluating clarifying information to either keep or revise initial instruction.

Range statement: The *well-defined engineering problem* may be a design requirement, an applied research and development requirement or a problematic situation in an existing component, system or process.

Outcome 2: Design or develop solutions to *well-defined engineering problems*.

Competency Indicators: Synthesis and working systematically in the development of solutions to a *well-defined engineering problem* is typified by:

- designing or developing solutions to *well-defined engineering problems* using appropriate theory and information technologies while checking impacts, sustainability and stakeholder views.
- systematically synthesising solutions and providing alternatives to the work, considering the immediate requirements, impacts and costs.
- stating the final solution and ensuring that the client or the supervisor agrees and providing engineering documentation.

Range statement: The solution is amenable to established methods, techniques or procedures, being cognisant of impacts and the need for sustainability.

Outcome 3: Comprehend and apply knowledge that is embodied in established engineering practices that is specific to the jurisdiction in which the Engineering Technician practices.

Competency Indicators: Competence in applying relevant knowledge to *well-defined engineering problems* is typified by:

- stating what engineering principles, practices, procedures, methodologies and technologies, including the application of the theory are applied in the practice area
- indicating an understanding of other areas of practice that interact with the practice area to underpin teamwork
- demonstrating knowledge and application of engineering standards, codes of practice, legislation, regulations and finance in the practice area.

Range statement: Technical knowledge that is knowledge applicable to the practice area. This is supplemented by legal, regulatory and locally relevant knowledge.

Outcome 4: Manage part or all of one or more *well-defined engineering activities*.

Competency indicators: The display of personal and work process management abilities in the competence area is typified by:

- managing self, people, work priorities, processes and resources when performing *well-defined* engineering work.
- planning, organising, leading and controlling *well-defined engineering activities*.
- managing contracts and other agreements and the ability to establish and maintain professional and business relationships.

Range statement: Management of *well-defined engineering activities* is directed at achieving results as a member or leader of a team by planning and harnessing people, resources, processes, systems, money and contracts or agreements.

Outcome 5: Communicate clearly using multiple mediums and collaborate inclusively with a broad range of stakeholders in the course of engineering activities.

Competency indicators: Effective and clear communication is typified by:

- the ability to write clear, concise and effective technical, legal and editorially correct documentation
- the ability to issue clear and concise instructions and/or guidance being cognisant of the audience and various skills levels
- the ability to execute oral presentations using structure, style, language, visual aids and supporting documents appropriate to the audience and the purpose.

Range statement: Communication with respect to *well-defined engineering problems* relates to the technical aspects and the wider impacts of professional work. The audience includes superiors, peers, subordinates, implementing teams, other disciplines, clients and stakeholders. Appropriate modes of communication must be selected.

Outcome 6: Recognise the reasonably foreseeable economic, social, cultural and environmental effects of *well-defined engineering activities* seeking to achieve sustainability.

Competency indicators: Competence in this outcome is typified by:

- the ability to identify interested and affected parties and their expectations with regard to technical, sociocultural and environmental effects, while considering the economics and long-term sustainability of the *well-defined engineering activities*
- measures taken to mitigate the negative effects of *well-defined engineering activities*.

Range statement: The impacts of *well-defined engineering activities* must be considered over the project life cycle paying due regard to the wide-ranging economic, social and cultural effects, including the protection of the environment and the need for sustainability.

Outcome 7: Meet all legal and regulatory requirements and protect the health and safety of persons during all *well-defined engineering activities*.

Competency indicators: Competence in this outcome is typified by:

- identifying applicable legal, regulatory, health and safety regulations requirements and standards for the *well-defined* engineering activity
- stating how health and safety regulations are applied and ensuring the safety of all affected persons through the use of safe and sustainable materials, components, processes and systems, and explaining when it was necessary to seek advice
- identifying risks and risk management strategies.

Range statement: The impacts of *well-defined engineering activities* must be considered over the project life cycle paying attention to health and safety, and legal and regulatory requirements.

Outcome 8: Conduct engineering activities ethically.

Competency indicators: Competence in this outcome is typified by:

- knowledge and compliance with the ECSA code of conduct for registered persons
- the identification of ethical problems and affected parties, and how the best solution to resolve the problem is selected.

Range statement: Ethical behaviour involves the comprehension and application of professional ethics, responsibilities and norms of engineering practice within one's own limits of competence.

Outcome 9: Exercise sound judgement by evaluating the outcomes, impacts and alternatives in the course of *well-defined engineering activities*.

Competency indicators: For *well-defined engineering activities* judgement is typified by:

- developing options and final solutions or approaches, which consider impacts, interrelationships with other disciplines, time, cost and other constraints including the absence of full evidence
- taking a view of the solution while considering risks, their consequences and the implications for stakeholders and affected parties.

Range statement: Judgement is expected in considering interactions between methods, techniques and procedures and their immediate impact on affected parties in making recommendations.

Outcome 10: Be responsible for making decisions on part or all of *well-defined engineering activities*.

Competency indicators: Competence in responsible decision-making is typified by:

- systematic gathering of related information and checking of facts and inputs required for the decision-making process
- making the final decision, based on knowledge, past experience and seeking advice on matters falling outside the applicant's education and experience
- recording the decision-making process and the reasons for the final decision
- taking responsibility and being prepared to be held accountable for immediate consequences of own work and evaluating any shortcomings in the output.

Range statement: Responsibility exercised for outcomes of significant parts of one or more *well-defined engineering activities*.

Outcome 11: Undertake sufficient professional development activities to maintain, extend competence and enhance the ability to adapt to emerging technologies and the ever-changing nature of work.

Competency indicators: Competence in self-development is typified by:

- explaining awareness and a strategy to independently enhance professional development
- evidence of self-development in chosen and new areas of expertise and personal development.

Range Statement: Professional development involves taking ownership, and independently planning, selecting, undertaking and recording appropriate activities to extend competence.

7. PROFESSIONAL COMPETENCY CHARACTERISTICS

Insofar as the time-based minimum requirements are concerned, the onus is on the Candidate to ensure fulfilment of all outcomes within the ambit of the definition of the appropriate complexity of the *engineering problem* and *activities* as explained below for each category of registration.

Over and above the explanations below, further contexts and functions of the outcomes defined in Section 6 may be found in the applicable *Discipline-specific Training Guidelines* (**R-05-XXX-PE/PT/PN)** and *Guide to the Competency Standards for Registration as Professionals* (**R-08-CS-GUIDE-PE/PT/PN**).

7.1 Professional Engineer

Complex engineering problems

Complex engineering problems have the following characteristics:

(a) Require in-depth, fundamental and specialised engineering knowledge that facilitates an analytical approach from first principles.

And one or more of the following*:*

(b) Ill-posed, under or over specified and require identification and refinement.

(c) High-level problems that include component parts or sub-problems.

(d) Unfamiliar or involve infrequently encountered issues.

And one or more of the following*:*

(e) Are not obvious and require abstract thinking or originality in analysis to formulate suitable models.

(f) Fall outside the scope of usual standards and codes.

(g) Require information from a variety of sources that is complex, abstract or incomplete.

(h) Involve wide-ranging or conflicting issues such as technical and engineering issues and interested or affected parties.

And one or both of the following:

(i) Require judgement in decision-making in uncertain contexts.

(j) Have significant consequences in a range of contexts.

Candidates often find challenges in determining whether an engineering problem can be classified as a *complex engineering problem*. Candidates should consult the guide in Table 3 in this regard.

Table 3: Test for a complex engineering problem

Step	Main question	Criteria
Step 1 Identification of the engineering problem	Is the problem an engineering problem?	a) Does solving the problem require in-depth fundamental and specialised engineering knowledge?
Step 2 Establishment of the level of complexity of the initial problem state	What is the nature of the problem? Does the problem have *one or more* of the characteristics b, c and d?	b) Ill-posed, under or over specified and requires identification and refinement.
		c) High-level and includes component parts or sub-problems.
		d) Unfamiliar or involves infrequently encountered issues.
Step 3 Complexity of the problem path from the initial state	What is encountered in the solution process? Do the solutions have *one or more* of the characteristics e, f, g and h?	e) Are not obvious and require originality or analysis based on fundamentals.
		f) Fall outside the scope of standards and codes.
		g) Require information from a variety of sources that are complex, abstract or incomplete.

Step	Main question	Criteria
		h) Involve wide-ranging or conflicting issues such as technical and engineering issues and interested or affected parties.
Step 4 Level of decision-making required and potential consequences	What is involved in the decision-making while solving the problem and evaluating the solution? Does it have *one or more* of the characteristics i and j?	i) Require judgement in decision-making in uncertain contexts.
		j) Have significant consequences in a range of contexts.

Complex engineering activities

Complex engineering activities have several of the following characteristics:

(a) The *scope* of activities may encompass entire complex engineering systems or complex subsystems and involve creative use of innovative approaches based on engineering principles and research-based knowledge.

(b) The *practice area* may extend beyond previous experiences, i.e., be unfamiliar and/or multidisciplinary, requiring principles-based approaches, identification, specification and teamwork.

(c) Require diverse and significant *resources*, including people, money, equipment, materials and technologies.

(d) Experience *constraints* and challenges with respect to time, finance, infrastructure, resources, facilities, applicable laws, standards and codes.

(e) Significant and complex *interactions* between wide-ranging and/or conflicting technical, engineering and other issues

(f) Significant *risks and consequences* in a range of contexts, requiring responsibility and accountability in decision-making and judgement.

7.2 Professional Engineering Technologist

Broadly defined engineering problems

Broadly defined engineering problems have the following characteristics:

(a) Require coherent and detailed engineering knowledge underpinning the applicable technology area.

And one or more of the following:

(b) Ill-posed, are under or over specified and require identification and interpretation into the technology area.
(c) Encompass systems within complex engineering systems.
(d) Belong to families of problems that are solved in well-accepted and innovative and sustainable ways.

And one or more of the following:

(e) Can be solved by structured analysis techniques.
(f) May be partially outside standards and codes. Justification must be provided to operate outside standards and codes.
(g) Require information from the practice area and the sources interfacing with the practice area, and this information is often complex or incomplete.
(h) Involve interested and affected parties with a variety of issues, considering conflicting constraints and the need for sustainability.

And one or both of the following:

(i) Require judgement in decision-making in the practice area and consideration of the interfaces with other areas.
(j) Have significant consequences that are important in the practice area and may extend more widely.

Candidates often find challenges in determining whether an engineering-problem can be classified as a *broadly defined engineering problem*. Candidates should consult the guide in Table 4 in this regard.

Table 4: Test for a broadly defined engineering problem

Step	Main question	Criteria
Step 1 Identification of the engineering problem	Is the problem an engineering problem?	a) Does solving the problem require coherent and detailed engineering knowledge underpinning the applicable technology area?

Step	Main question	Criteria
Step 2 Establishment of the level of complexity of the initial problem state	What is the nature of the problem? Does the problem have *one or more* of the characteristics b, c and d?	b) Ill-posed, is under or over specified and requires identification and refinement into the technology area.
		c) Encompasses systems within complex engineering systems.
		d) Belong to families of problems that are solved in well-accepted and innovative and sustainable ways.
Step 3 Complexity of the problem path from the initial state	What is encountered in the solution process? Do the solutions have *one or more* of the characteristics e, f, g and h?	e) Can be solved by structured analysis techniques.
		f) May be partially outside standards and codes. Justification to operate outside these standards and codes must be provided.
		g) Require information from a variety of sources that are complex, abstract or incomplete.
		h) Involve interested and affected parties with a variety of issues, considering conflicting constraints and the need for sustainability.
Step 4 Level of decision-making required and potential consequences	What is involved in the decision-making while solving the problem and evaluating the solution? Does it have *one or more* of the characteristics i and j?	i) Require knowledge and judgement in decision making in the practice area and require consideration of the interface with other areas.
		j) Have significant consequences that are important in the practice area but may extend more widely.

Broadly defined engineering activities

Broadly defined engineering activities have several of the following characteristics:

(a) The *scope* of the practice area is linked to the technologies used and the changes due to the adoption of new technology into current practice.

(b) The *practice area* is located within a wider context; it requires teamwork and has interfaces with other parties and disciplines.

(c) Required the use of a variety of *resources*, including people, money, equipment, materials and technologies.

(d) *Constrained* by available technology, time, finance, infrastructure, resources, facilities, applicable laws, standards and codes.

(e) Require the resolution of occasional problems arising from *interactions* between wide-ranging or conflicting issues such as technical, engineering and other issues.

(f) Have significant *risks* and *consequences* in the practice area and related areas.

7.3 Professional Engineering Technician

Well-defined engineering problems

Well-defined engineering problems have the following characteristics:

(a) Can be solved mainly by practical engineering knowledge underpinned by related theory.

And one or more of the following:

(b) Largely defined but may require clarification.

(c) Discrete, focused tasks within engineering systems.

(d) Routine and frequently encountered and may be unfamiliar but in a familiar context.

And one or more of the following:

(e) Can be solved in standardised or prescribed ways.

(f) Encompassed by standards, codes and documented procedures (authorisation required to work outside limits).

(g) Information is concrete and largely complete but requires checking and possible supplementation.

(h) Involve a limited range of interested and affected parties with defined issues, considering a few conflicting constraints and the need for sustainability.

And one or both of the following:

(i) Interpretation requires practical judgement in the practice area in evaluating solutions and in considering interfaces with other role-players.

(j) Have consequences that are locally important but are not far reaching (wider impacts are dealt with by others).

Candidates often find challenges in determining whether an engineering problem can be classified as a *well-defined engineering problem*. Candidates should consult the guide in Table 5 in this regard.

Table 5: Illustrating the test for a well-defined engineering problem

Step	Main question	Criteria
Step 1 Identification of the engineering problem	Is the problem an engineering problem?	a) Can it be solved mainly by practical engineering knowledge that is underpinned by related theory?
Step 2 Establishment of the level of complexity of the initial problem state	What is the nature of the problem? Does the problem have *one or more* of the characteristics b, c and d?	b) Largely defined but may require clarification. c) Discrete, focused task within engineering systems. d) Routine and frequently encountered and may be unfamiliar but in a familiar context.
Step 3 Determine the complexity of the solution path from the initial state	What is encountered in the solution process? Do the solutions have *one or more* of the characteristics e, f, g and h?	e) Can be solved in standardised or prescribed ways. f) Encompassed by standards, codes and documented procedures (require authorisation to work outside limits). g) Requires information that is concrete and largely complete but require checking and possible supplementation. h) Involve a limited range of interested and affected parties with defined issues, considering a few conflicting constraints and the need for sustainability.
Step 4 Determine the level of decision-making required and potential consequences	What is involved in decision-making while solving the problem and in evaluating the solution? Does it have one of the characteristics, i or j?	i) Require practical judgement in the practice area of evaluating solutions and considering interfaces with other role-players? j) Have consequences that are locally important but not far reaching (wider impacts are dealt with by others)?

Well-defined engineering activities

Well-defined engineering activities have several of the following characteristics:

(a) The *scope* of activities relates to existing techniques applied, materials or processes and the adoption of modified or new techniques, materials or processes.

(b) The *practice area* is located within a wide context and involves well-defined working relationships with other parties and disciplines.

(c) Requires a familiar and defined range of *resources*, including people, money, equipment, materials and technologies.

(d) *Constrained* by operational context, defined work packages, time, finance, infrastructure, resources, facilities, applicable laws, standards and codes.

(e) Resolution of *interactions* between limited technical, engineering and other issues.

(f) Demonstrate *risks* and *consequences* that are locally important but are not generally far reaching.

8. COMPARATIVE COMPETENCY STANDARDS

Table 6 provides the competency standards for each category for Candidates to do a comparative check to determine at which level they are currently working.

Table 6: Comparative Competency Standards

Professional Engineer	Professional Engineering Technologist	Professional Engineering Technician
Outcome 1: Define, investigate and analyse *complex engineering problems*.	**Outcome 1**: Define, investigate and analyse *broadly defined engineering problems.*	**Outcome 1**: Define, investigate and analyse *well-defined engineering problems*.
Competency indicators	**Competency indicators**	**Competency indicators**
The definition, investigation and analysis of *complex engineering problems* is typified by:	The definition, investigation and analysis of *broadly defined engineering problems* is typified by:	The definition, investigation and analysis of *well-defined engineering problems* is typified by:
• Defining the engineering problems and procedures for solving the problems.	• Performing or contributing to defining *broadly defined engineering problems*, thus leading to an agreed definition of the problems to be solved.	• Interpreting received work instructions, checking with the client or supervisor that the interpretation is correct.
• Investigating and evaluating pertinent information and identifying systems and sub-systems of complex problems including collecting, organising and evaluating information from all applicable sources including in-situ investigations where appropriate.	• Investigating or contributing to investigating engineering problems, including collecting, organising and evaluating information from all applicable sources including in-situ investigations where appropriate.	• Collecting and organising clarifying data from all applicable sources including in-situ investigations where appropriate.

Professional Engineer	Professional Engineering Technologist	Professional Engineering Technician
• Analysing relevant assumptions, inputs and required outputs of a complex engineering problem.	• Performing or contributing to analysing engineering problems, using conceptualisation, justified assumptions, limitations and evaluation of results.	• Analysing, interpreting and evaluating clarifying information to either keep or revise initial instruction.
Range statement	**Range statement**	**Range statement**
The *complex engineering problem* may be a design requirement, an applied research and development requirement or a problematic situation in an existing component, system or process.	The *broadly defined engineering problem* may be a design requirement, an applied research and development requirement or a problematic situation in an existing component, system or process.	The *well-defined engineering problem* may be a design requirement, an applied research and development requirement or a problematic situation in an existing component, system or process.
Outcome 2: Design or develop solutions to *complex engineering problems.*	**Outcome *2:***-Design or develop solutions to *broadly defined engineering problems.*	**Outcome 2**: Design or develop solutions to *well-defined engineering problems.*
Competency indicators	**Competency indicators**	**Competency indicators**
Synthesis and working systematically in the development of solutions to a complex engineering problem is typified by:	Synthesis and working systematically in the development of solutions to a *broadly defined engineering problem* is typified by:	Synthesis and working systematically in the development of solutions to a *well-defined engineering problem* is typified by:
• Designing or developing solutions to complex engineering problems using appropriate theory and information technologies while checking impacts, sustainability and stakeholder views.	• Designing or developing solutions to *broadly defined engineering problems* using appropriate theory and information technologies while checking impacts, sustainability and stakeholder views.	• Designing or developing solutions to *well-defined engineering problems* using appropriate theory and information technologies while checking impacts, sustainability and stakeholder views.
• Systematically synthesising solutions and providing alternatives by making use of first or fundamental principles within unfamiliar or	• Systematically synthesising solutions and providing alternatives by analysing designs, correlating with	• Systematically synthesising solutions and providing alternatives to the work, considering the immediate requirements, impacts and costs.

Professional Engineer	Professional Engineering Technologist	Professional Engineering Technician
previously encountered techniques and testing the validity and reasonability of assumptions, correlating with requirements and considering the far-reaching impacts and costs.	requirements and considering the wide-ranging impacts and costs.	
• Evaluating the final solution and developing documentation and an integrated implementation plan.	• Creating detailed specification requirements and designing documentation for implementation to the satisfaction of the client.	• Stating the final solution and ensuring that the client or the supervisor agrees and providing engineering documentation.
Range statement	**Range statement**	**Range statement**
The solution is amenable to widely applied principles, sound and testable assumptions, underpinned by the utilisation of requisite advanced principles relevant to the problem, being cognisant of impacts and the need for sustainability.	The solution is amenable to widely accepted methods, techniques or procedures, being cognisant of impacts and the need for sustainability.	The solution is amenable to established methods, techniques or procedures, being cognisant of impacts and the need for sustainability.
Outcome 3: Comprehend and apply advanced and local knowledge of the widely applied principles underpinning good practice that is specific to the jurisdiction in which the Engineer practices.	**Outcome 3:** Comprehend and apply the knowledge embodied in widely accepted and applied engineering procedures, processes, systems and methodologies that is specific to the jurisdiction in which the Engineering Technologist practices.	**Outcome 3:** Comprehend and apply knowledge that is embodied in established engineering practices that is specific to the jurisdiction in which the Engineering Technician practices.
Competency indicators	**Competency indicators**	**Competency indicators**
Competence in applying relevant knowledge to *complex engineering problems* is typified by:	Competence in applying relevant knowledge to *broadly defined engineering problems* is typified by:	Competence in applying relevant knowledge to *well-defined engineering problems* is typified by:

Professional Engineer	Professional Engineering Technologist	Professional Engineering Technician
• Stating what fundamental engineering principles, practices, sound testable assumptions or previously encountered techniques, including the application of NQF 8 theory are applied in the practice area.	• Stating what engineering principles, practices, procedures, methodologies and technologies, including the application of NQF 7 theory are applied in the practice area.	• Stating what engineering principles, practices, procedures, methodologies and technologies, including the application of NQF 6 theory are applied in the practice area.
• Indicating a working knowledge of interacting disciplines (engineering and other) to underpin teamwork.	• Indicating a working knowledge of areas of practice that interact with the practice area to underpin teamwork.	• Indicating an understanding of other areas of practice that interact with the practice area to underpin teamwork.
• Demonstrating knowledge and application of engineering standards, codes of practice, legislation, regulations and finance in the practice area.	• Demonstrating knowledge and application of engineering standards, codes of practice, legislation, regulations and finance in the practice area.	• Demonstrating knowledge and application of engineering standards, codes of practice, legislation, regulations and finance in the practice area.
Range statement	**Range statement**	**Range statement**
In-depth specialist knowledge in the practice area that supports a fundamentals-based, first-principles analytical approach. This is supplemented by legal, regulatory and locally relevant knowledge.	Technological knowledge that is well-established and applicable to the practice area. This knowledge is supplemented by legal, regulatory and locally relevant knowledge. Emerging technologies are adopted from the formulations of others.	Technical knowledge, which is knowledge applicable to the practice area. This is supplemented by legal, regulatory and locally relevant knowledge.

Professional Engineer	Professional Engineering Technologist	Professional Engineering Technician
Outcome 4: Manage part or all of one or more *complex engineering activities.*	**Outcome 4:** Manage part or all of one or more *broadly defined engineering activities.*	**Outcome 4:** Manage part or all of one or more *well-defined engineering activities.*
Competency indicators	**Competency indicators**	**Competency indicators**
The display of personal and work process management abilities in the competence area is typified by:	The display of personal and work process management abilities in the competence area is typified by:	The display of personal and work process management abilities in the competence area is typified by:
• Managing self, people, work priorities, processes and resources when performing complex engineering activities.	• Managing self, people, work priorities, processes and resources when performing *broadly defined engineering activities*.	• Managing self, people, work priorities, processes and resources when performing *well-defined* engineering work.
• Planning, organising, leading and controlling complex engineering activities.	• Planning, organising, leading and controlling *broadly defined engineering activities*.	• Planning, organising, leading and controlling *well-defined engineering activities*.
• Managing contracts and other agreements and the ability to establish and maintain professional and business relationships.	• Managing contracts and other agreements and the ability to establish and maintain professional and business relationships.	• Managing contracts and other agreements and the ability to establish and maintain professional and business relationships.
Range statement	**Range statement**	**Range statement**
Management of *complex engineering activities* is directed at achieving results as a member or leader of a team by planning and harnessing people, resources, processes, systems, money and contracts or agreements.	Management of *broadly defined engineering activities* is directed at achieving results as a member or leader of a team by planning and harnessing people, resources, processes, systems, money and contracts or agreements.	Management of *well-defined engineering activities* is directed at achieving results as a member or leader of a team by planning and harnessing people, resources, processes, systems, money and contracts or agreements.

Professional Engineer	Professional Engineering Technologist	Professional Engineering Technician
Outcome 5: Communicate clearly using multiple mediums and collaborate inclusively with a broad range of stakeholders in the course of engineering activities.		
Competency indicators		
Effective and clear communication is typified by:		
• The ability to write clear, concise and effective technical, legal and editorially correct documentation.		
• The ability to issue clear and concise instructions and/or guidance being cognisant of the audience and various skills levels.		
• The ability to execute oral presentations using structure, style, language, visual aids and supporting documents appropriate to the audience and the purpose.		
Range statement		
Communication with respect to *complex engineering problems* relates to the technical aspects and the wider impacts of professional work. The audience includes superiors, peers, subordinates, implementing teams, other disciplines, clients and stakeholders. Appropriate modes of communi cation must be selected.		
Outcome 6: Recognise the reasonably foreseeable economic, social, cultural, and environmental effects of *complex engineering activities* seeking to achieve sustainability.	**Outcome 6:** Recognise the reasonably foreseeable economic, social, cultural, and environmental effects of *broadly defined engineering activities* seeking to achieve sustainability.	**Outcome 6**: Recognise the reasonably foreseeable economic, social, cultural, and environmental effects of *well-defined engineering activities* seeking to achieve sustainability.

Professional Engineer	Professional Engineering Technologist	Professional Engineering Technician
Competency indicators	**Competency indicators**	**Competency indicators**
Competence in this outcome is typified by:	Competence in this outcome is typified by:	Competence in this outcome is typified by:
• The ability to identify interested and affected parties and their expectations with regard to technical, sociocultural and environmental effects, while considering the economics and long-term sustainability of the *complex engineering activities*.	• The ability to identify interested and affected parties and their expectations with regard to technical, sociocultural and environmental effects, while considering the economics and long-term sustainability of the *broadly defined engineering activities*.	• The ability to identify interested and affected parties and their expectations with regard to technical, sociocultural and environmental effects, while considering the economics and long-term sustainability of the *well-defined engineering activities*.
• Measures taken to mitigate the negative effects of *complex engineering activities*.	• Measures taken to mitigate the negative effects of *broadly defined engineering activities*.	• Measures taken to mitigate the negative effects of *well-defined engineering activities*.
Range statement	**Range statement**	**Range statement**
The impacts of *complex engineering activities* must be considered over the project life cycle paying due regard to the far-reaching economic, social and cultural effects, including the protection of the environment and the need for sustainability.	The impacts of *broadly defined engineering activities* must be considered over the project life cycle paying due regard to the wide-ranging economic, social and cultural effects, including the protection of the environment and the need for sustainability.	The impacts of *well-defined engineering activities* must be considered over the project life cycle paying due regard to the wide-ranging economic, social and cultural effects, including the protection of the environment and the need for sustainability.
Outcome 7: Meet all legal and regulatory requirements and protect the health and safety of persons during all *complex engineering activities*.	**Outcome 7:** Meet all legal and regulatory requirements and protect the health and safety of persons during all *broadly defined engineering activities*.	**Outcome 7:** Meet all legal and regulatory requirements and protect the health and safety of persons during all *well-defined engineering activities*.

Professional Engineer	Professional Engineering Technologist	Professional Engineering Technician
Competency indicators	**Competency indicators**	**Competency indicators**
Competence in this outcome is typified by:	Competence in this outcome is typified by:	Competence in this outcome is typified by:
• Identifying applicable legal, regulatory, health and safety regulations requirements and standards for the *complex engineering activity*.	• Identifying applicable legal, regulatory, health and safety regulations requirements and standards for the *broadly defined engineering activity*.	• Identifying applicable legal, regulatory, health and safety regulations requirements and standards for the *well-defined* engineering activity.
• Applying health and safety regulations and ensuring the safety of all affected persons through the use of safe and sustainable materials, components, processes and systems.	• Stating circumstances in which the applicant assisted in or demonstrated awareness regarding health and safety regulations and ensuring the safety of all affected persons through the use of safe and sustainable materials, components, processes and systems.	• Stating how health and safety regulations are applied and ensuring the safety of all affected persons through the use of safe and sustainable materials, components, processes and systems, and explaining when it was necessary to seek advice.
• Identifying risks and risk management strategies.	• Identifying risks and risk management strategies.	• Identifying risks and risk management strategies.
Range statement	**Range statement**	**Range statement**
The impacts of *complex engineering activities* must be considered over the project life cycle paying attention to health and safety, and legal and regulatory requirements.	The impacts of *broadly defined engineering activities* must be considered over the project life cycle paying attention to health and safety, and legal and regulatory requirements.	The impacts of *well-defined engineering activities* must be considered over the project life cycle paying attention to health and safety, and legal and regulatory requirements.

Professional Engineer	Professional Engineering Technologist	Professional Engineering Technician
Outcome 8: Conduct engineering activities ethically.		
Competence in this outcome is typified by:		
• Knowledge and compliance with the ECSA Code of Conduct for registered persons.		
• The identification of ethical problems and affected parties, and a systematic approach to resolving the issues.		
Range statement		
Ethical behaviour involves the comprehension and application of professional ethics, responsibilities and norms of engineering practice within one's own limits of competence.		
Outcome 9: Exercise sound judgement by evaluating the outcomes, impacts and alternatives in the course of *complex engineering activities*.	**Outcome 9**: Exercise sound judgement by evaluating the outcomes, impacts and alternatives in the course of *broadly defined engineering activities*.	**Outcome 9**: Exercise sound judgement by evaluating the outcomes, impacts and alternatives in the course of *well-defined engineering activities*.
Competency indicators	**Competency indicators**	**Competency indicators**
For *complex engineering activities* judgement is typified by:	For *broadly defined engineering activities* judgement is typified by:	For *well-defined engineering activities* judgement is typified by:
• Developing options and final solutions or approaches, which consider impacts, interrelationships with other disciplines, time, cost and other wider constraints, including the absence of full evidence.	• Developing options and final solutions or approaches, which consider impacts, interrelationships with other disciplines, time, cost, and other constraints, including the absence of full evidence.	• Developing options and final solutions or approaches, which consider impacts, interrelationships with other disciplines, time, cost and other constraints including the absence of full evidence.

Professional Engineer	Professional Engineering Technologist	Professional Engineering Technician
• Taking a holistic view of the solution while considering risks, their consequences and the implications for stakeholders and other affected parties.	• Taking a wide-ranging view of the solution while considering risks, their consequences and the implications for stakeholders and affected parties.	• Taking a view of the solution while considering risks, their consequences and the implications for stakeholders and affected parties.
Range statement	**Range statement**	**Range statement**
Judgement is expected in considering the interactions between conflicting technical, engineering, social or other issues and their far-reaching impact on affected parties in making recommendations.	Judgement is expected in considering the interactions between technical, engineering, social or other issues and their wide-ranging impact on affected parties in making recommendations.	Judgement is expected in considering interactions between methods, techniques and procedures and their immediate impact on affected parties in making recommendations.
Outcome 10: Be responsible for making decisions on part or all of *complex engineering activities*.	**Outcome 10**: Be responsible for making decisions on part or all of *broadly defined engineering activities*.	**Outcome 10**: Be responsible for making decisions on part or all of *well-defined engineering activities*.
Competency indicators	**Competency indicators**	**Competency indicators**
Competence in responsible decision-making is typified by:	Competence in responsible decision-making is typified by:	Competence in responsible decision-making is typified by:
• Systematic gathering of related information and checking of facts and inputs required for the decision-making process.	• Systematic gathering of related information and checking of facts and inputs required for the decision-making process.	• Systematic gathering of related information and checking of facts and inputs required for the decision-making process.

Professional Engineer	Professional Engineering Technologist	Professional Engineering Technician
• Making the final decision, based on knowledge, past experience and seeking advice on matters falling outside the applicant's education and experience.	• Making the final decision, based on knowledge, past experience and seeking advice on matters falling outside the applicant's education and experience.	• Making the final decision, based on knowledge, past experience and seeking advice on matters falling outside the applicant's education and experience.
• Keeping record of the decision-making process and the reasons for the final decision.	• Keeping record of the decision-making process and the reasons for the final decision.	• Keeping record of the decision-making process and the reasons for the final decision.
• Taking responsibility and being prepared to be held accountable for far-reaching and significant consequences (whether positive or negative).	• Taking responsibility and being prepared to be held accountable for far-reaching and significant consequences (whether positive or negative).	• Taking responsibility and being prepared to be held accountable for immediate consequences of own work and evaluating any shortcomings in the output.
Range statement	**Range statement**	**Range statement**
Responsibility exercised for outcomes of significant parts of one or more *complex engineering activities*.	Responsibility exercised for outcomes of significant parts of one or more *broadly defined engineering activities*.	Responsibility exercised for outcomes of significant parts of one or more *well-defined engineering activities*.
Outcome 11: Undertake sufficient professional development activities to maintain, extend competence and enhance the ability to adapt to emerging technologies and the ever-changing nature of work.		
Competency indicators		
Competence in self-development is typified by:		
• Explaining awareness and a strategy to independently enhance professional development.		
• Evidence of self-development in chosen and new areas of expertise and personal development.		
Range statement		

Professional Engineer	Professional Engineering Technologist	Professional Engineering Technician
Professional development involves taking ownership, and independently planning, selecting, undertaking and recording appropriate activities to extend competence.		

REVISION HISTORY

Revision number	Revision date	Revision details	Approved by
Draft A	08 April 2020	Merging of R-02-STA-PE/PT/PCE/PN	RPS BU
Rev 0	06 July 2020	The R-02-PE, R-02-PT, R-02-PCE and R-02-PN are combined into R-02-STA-PE/PT/PCE/PN Knowledge component and summarised competency tables have been added. Alignment to the Policy and Standards Development Framework on ECSA Policies	RPS Executive
Rev 1	16 July 2020	Approval	RPSC
Rev 1	20 August 2020	Ratification	Council
Rev. 2 Draft A	29 April 2022	Removing Professional Certificated Engineer parts from the PE/PT/PN Standard as per RPSC recommendation to have the Professional Certificated Engineer own Standard	RDDR BU and Registration BU.
Rev. 2 Draft B	03 May 2022	Review and Recommendation for Approval	Acting RPS Executive
Rev. 2	18 May 2022	Approval	RPSC
Rev. 2	18 May 2022	Added Outcome 8 and Outcome 11, it was erroneously deleted from Table 7: Competency Standards	RDDR BU and Registration BU
Rev. 3 Draft A	12 April 2023	Working Group - Alignment of 2021 IEA standards to ECSA standards.	RDDR BU and Working group
Rev. 3 Draft B	19 April 2023	Proposed changes of the Graduate Attributes and Professional Competencies presented to the CRC for inputs and comments	Registration BU and CRC
Rev. 3 Draft C	26 June 2023	Working Group unified the inputs from the CRC and submitted final draft	RDDR BU and Working group
Rev. 3	10 July 2023	Approval	RPSC

Rev. 3	10 July 2023	A note was inserted under the appendix table: **"**Applicants who obtain benchmark qualification after meeting the required experience can apply for professional registration in that category."	Executive: Statutory Service

The Competency Standard for:

Registration in Professional Categories as Professional Engineer, Technologist and Technician

Revision 3 dated 10 July 2023 consisting of 44 pages have been reviewed for adequacy by the Business Unit Manager and is approved by the Executive: Research, Policy and Standards (RPS).

..... 12/07/2023.....

Business Unit Manager Date

..... 13/07/2023.....

Executive: RPS Date

This definitive version of this policy is available on our website

Appendix A: Minimum experience and responsible experience for Professional Engineering Technologist registration

To register as a Professional Engineering Technologist, the appropriate minimum experience at the suitable complexity post qualification is tabled below*. Only post qualification experience that meets the following requirements, will be considered:

Table 7: Minimum experience and responsible experience for Professional Engineering Technologist registration

Qualification Title/Name	Experience (Years)	Responsible Experience (Years)
Prior to 1971		
ATC1/NTC2nn	14	10
ATC2/NTC5	13	9
NTD/NED	11	8
NDT	6	4
NHDT (Only Elec & Mech)	5	3
No Tertiary Qualification & N3	20	10
1972–1980		
NCT/NND	10	6
NHCT	9	5
ID	11	7
NDT	6	4
Mdip	3	1
T1 (Cert)	14	10
T1(Dipl)	13	9
T2 (Cert)	12	8
T2(Dipl)	11	7
Post 1980		
N4	14	10
N5	13	9
N6	11	8

Qualification Title/Name	Experience (Years)	Responsible Experience (Years)
NTD	10	7
Adv Cert (Eng)	8	5
Adv Cert (Eng Prac)	8	5
NDip	8	5
Dip Eng	8	5
Dip Eng Tech	8	5
HND	6	4
BTech (Benchmark)	3	1
Adv Dip Eng (Benchmark)	3	1
BEng Tech (Benchmark)	3	1

***Note:** Applicants who obtain benchmark qualification after meeting the required experience can apply for professional registration in that category

Appendix B: Minimum experience and responsible experience for Professional Engineering Technician registration

To register as a Professional Engineering Technician, the appropriate minimum experience at the suitable complexity post qualification is tabled below*. Only post qualification experience that meets the following requirements, will be considered:

Table 8: Minimum experience and responsible experience for Professional Engineering Technician registration

Qualification Title/Name	Experience (Years)	Responsible Experience (Years)
Prior to 1971		
ATC1/NTC4	8	1
ATC2/NTC5	7.5	1
NTD/NED	6	1
Nat Dip.Tech	3	1
NHDT (Only Elec & Mech)	3	1
No Tertiary Qualification & N3	10	1
1972–1980		
NCT/NND	6	1
NHCT	6	1
ID	6	1
NDT	3	1
Master Dip. Technology	3	1
T1 (Cert)	11	8.5
T1 (Dipl)	8	1
T2 (Cert)	7.5	1
T2 (Dip)	6	1
Post 1980		
N4	8	1
N5	7.5	1
N6	7	1

Qualification Title/Name	Experience (Years)	Responsible Experience (Years)
NTD/NNDip	6	1
Adv Cert (Eng Prac) (Benchmark)	3	1
NDip (Benchmark)	3	1
Dip Eng (Benchmark)	3	1
Dip Eng Tech (Benchmark)	4	1
HNDip	3	1
BTech	3	1
Adv Dip Eng	3	1
BEng Tech	3	1

***Note:** Applicants who obtain benchmark qualification after meeting the required experience can apply for professional registration in that category