



ENSURING THE EXPERTISE TO GROW SOUTH AFRICA

**Competency Standard for Registration as a Professional
Engineering Technologist**

R-02-PT

Revision: 3: 11 September 2018

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DEFINITIONS

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

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

Continuing Professional Development: The systematic and accountable maintenance, improvement and broadening of knowledge and skills and the development of personal qualities necessary for the execution of professional and technical duties throughout the career of an engineering practitioner

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

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

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 will require 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 in a particular competency area

Management of engineering works or activities: The co-ordinated activities required

- to direct and control all that is constructed or results from construction or manufacturing operations;

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- to operate engineering works safely and in the manner intended;
- to return engineering works, plant and equipment to an acceptable condition by the renewal, replacement or mending of worn, damaged or decayed parts;
- to control and manage procurement within engineering works or operations;
- to direct and control engineering processes and systems together with the commissioning, operation and decommissioning of equipment; and
- to maintain engineering works or equipment in a state in which they can perform their required functions.

Outcome: A statement of the performance at the professional level that a person must demonstrate in order to be judged competent to operate in a competency area

Over-determined problem: A problem for which the requirements are defined in excessive detail, making the required solution impossible to attain in all of its aspects


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 in a particular competency area

Sustainable development: Development that meets the needs of the present generation without compromising the ability of future generations to meet their own needs. Engineering should not only consider decreasing impacts but also consider restoring and regenerating through design.

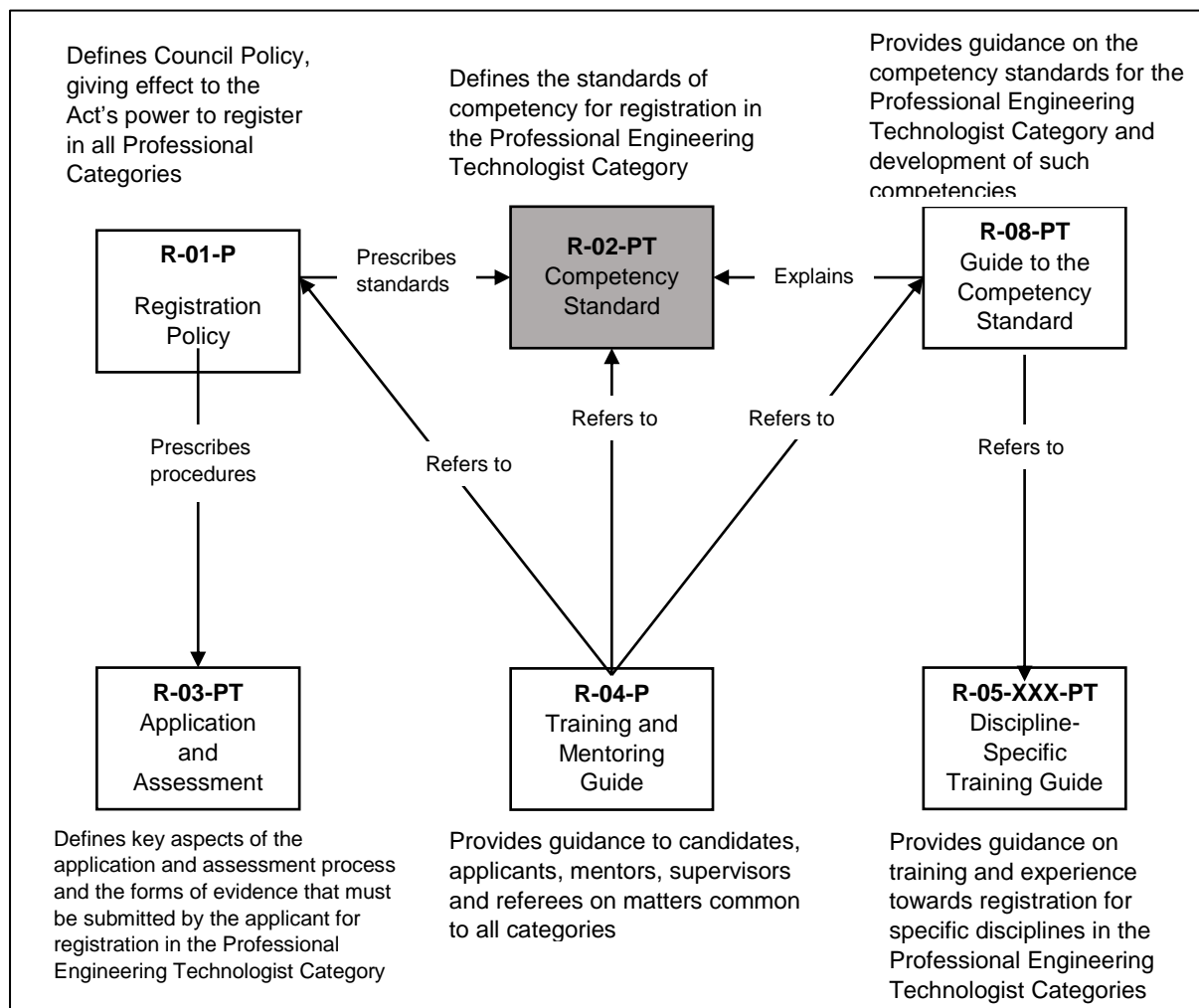
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BACKGROUND: ECSA REGISTRATION SYSTEM DOCUMENTS

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.




ECSA registration system documents

The professional registration of engineers based on education and training can be broadly classified as

- Professional Engineer
- **Professional Engineering Technologist**

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- Professional Certificated Engineer
- Professional Engineering Technician
- Other specified category

Professionally registered engineers are 'different but of equal value', a point emphasised by the ECSA. The experience standards of a Professional Engineering Technologist are characterised by

- solving broadly defined problems through the application of proven techniques and procedures;
- developing, maintaining and managing today's technologies;
- exercising professional judgement;
- managing resources; and
- assuming responsibility as the appointed competent person in terms of the Occupational Health and Safety Act, the Mine Health and Safety Act and the Merchant Shipping Act.

1. PURPOSE


This Competency Standard defines the competence required for registration as a Professional Engineering Technologist. Abbreviations and definitions of terms having particular meaning within this standard are listed above and are presented in the text. The competency indicators are listed in Appendix A.

2. DEMONSTRATION OF COMPETENCE

Competence must be demonstrated within broadly defined engineering activities by integrated performance of the Outcomes defined in Section 3 at the level specified for each Outcome. Required contexts and functions may be referred to in the applicable Discipline Specific Training Guidelines (e.g. **R-05-CIV-PT**, etc.).

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2.1 Level descriptor:

Broadly defined engineering activities are characterised by several or all of the following:

- 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.
- The practice area is located within a wider, complex context; it requires teamwork and has interfaces with other parties and disciplines.
- The activities involve the use of a variety of resources, including people, money, equipment, materials and technologies.
- Activities require the resolution of occasional problems arising from interactions between wide-ranging or conflicting issues such as technical and engineering issues.
- Activities are constrained by available technology, time, finance, infrastructure, resources, facilities, applicable laws, standards and codes.
- Activities have significant risks and consequences in the practice area and related areas.

2.2 Activities

Activities include design; planning; investigation and problem resolution; improvement of materials, components, systems and processes; implementation, manufacture and construction; engineering operations; maintenance; project management; and research, development and commercialisation.

3. COMPETENCY STANDARDS


3.1 Group A Outcomes: Engineering problem-solving

3.1.1 Outcome 1

Define, investigate and analyse broadly defined engineering problems

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Level descriptor

Broadly defined engineering problems require coherent and detailed engineering knowledge underpinning the applicable technology area.

Broadly defined engineering problems demonstrate one or more of the following characteristics:

- The problems are ill-posed, are under or over specified and require identification and interpretation into the technology area.
- The problems encompass systems within complex engineering systems.
- The problems belong to families of problems that are solved in well-accepted and innovative and sustainable ways.

And one or more of the following:

- The problems can be solved by structured analysis techniques.
- The problems may be partially outside standards and codes. Justification must be provided to operate outside standards and codes.
- The problems require information from the practice area and the sources interfacing with the practice area, and this information is often complex or incomplete.
- The problems involve a variety of issues that may impose conflicting technical constraints.

And one or both of the following:


- The problems require judgement in decision-making in the practice area and consideration of the interfaces with other areas.
- The problems have significant consequences that are important in the practice area and may extend more widely.

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. The problem is amenable to solution by technologies that are applicable to the

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competence area and known to the applicant. This Outcome is concerned with the understanding of the problem.

3.1.2 Outcome 2

Design or develop solutions to broadly defined engineering problems

Range statement

Solutions to broadly defined engineering problems are enabled by the technologies in the applicant's competence area. Engineering should not only consider decreasing impacts but also restoring and regenerating through design. This Outcome is concerned with the solution to the problem.

3.1.3 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 applicant practises


Range statement

Applicable knowledge includes the following:

- Technological knowledge that is well-established and applicable to the practice area, irrespective of location. This knowledge is supplemented by locally relevant knowledge, for example, established properties of local materials. Emerging technologies are adopted from the formulations of others.
- A working knowledge that is confined to the competence area of interacting disciplines (engineering and other) to underpin teamwork.
- Jurisdictional knowledge that includes legal and regulatory requirements and locally relevant codes of practice as required for the practice area (i.e. law of contract, contract administration, health and safety, environmental, application of sustainable materials and practices, intellectual property, quality management, risk management, maintenance management, regulation, project management and construction management).

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3.2 Group B Outcomes: Managing engineering activities

3.2.1 Outcome 4

Manage part or all of one or more broadly defined engineering activities

3.2.2 Outcome 5

Communicate clearly with others in the course of one's engineering activities

Range statement

For Outcomes 4 and 5, management and communication in regard to broadly defined engineering problems involve

- planning the activities;
- organising the activities;
- leading the activities;
- implementing the activities; and
- controlling the activities.

Communication relates to the technical aspects and the wider impacts of professional work. The audience includes supervisors, peers, subordinates, other disciplines, clients and all stakeholders confined to the competence area. Appropriate modes of communication must be selected. The Engineering Technologist is expected to perform the communication functions reliably and repeatedly.


3.3 Group C Outcomes: Impacts of engineering activity

3.3.1 Outcome 6

Recognise and address the foreseeable social, cultural, environmental and sustainability effects of broadly defined engineering activities.

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3.3.2 Outcome 7

Meet all legal and regulatory requirements, protect the health and safety of persons and adhere to sustainable practices in the course of the broadly defined engineering activities.

Range statement for Outcomes 6 and 7

Impacts and regulatory requirements include the following:

- Requirements include both explicitly regulated factors and factors that arise in the course of a particular work.
- Impacts considered extend over the lifecycle of the project and include the consequences of the technologies applied.
- Effects to be considered include the direct and indirect effects and the immediate and long-term impacts that are related to the technology used.
- Safe and sustainable materials, components and systems must be employed.
- Regulatory requirements are explicit for the context and general.
- Defined and widely accepted risk management strategies must be applied.
- The health and safety of persons located both inside and outside the workplace must be protected.

3.4 Group D Outcomes: Exercise judgement, take responsibility and act ethically

3.4.1 Outcome 8


Conduct engineering activities ethically

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.

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3.4.2 Outcome 9

Exercise sound judgement in the course of broadly defined engineering activities

Range statement

Judgement is expected in the application of the applicant's technologies and in their wider impacts. Judgement is also expected in dealings regarding interfaces with other disciplines and other technologies. Judgement in decision-making involves

- consideration of several risk factors;
- reduced consequences in a technology application and related contexts; and
- consideration of the ranges of interested and affected parties and their varying needs in addition to the need for sustainability.

3.4.3 Outcome 10

Be responsible for making decisions on part or all of broadly defined engineering activities

Range statement

The applicant is expected to demonstrate discharging responsibility adequately in regard to significant parts of one or more broadly defined engineering activities.

3.5 Group E Outcomes: Continuing Professional Development

3.5.1 Outcome 11

Undertake sufficient professional development activities to maintain and extend competence


Range statement

Professional development involves

- taking ownership of own professional development;
- planning own professional development strategy;
- selecting appropriate professional development activities; and

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- recording professional development strategy and activities while displaying independent learning ability.

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REVISION HISTORY

Revision Number	Revision Date	Revision Details	Approved By
Rev. 1:	2006		Approved by Council
Rev. 1 Draft A	25 Nov 2010	Level descriptors revised; assessment criteria moved into R-04-P	JIC Working Document
Rev. 1 Draft B	15 Feb 2011	Editorial and formatting	Submitted to Council for approval
Rev. 1.1	17 March 2011	Minor editorial changes	Approved by Council
Rev. 1.2	11 Jan 2012	Wording added	Approved by Council
Rev. 2 Concept A	15 Jan 2015	Illustration (Section 1) added; assessment criteria reintroduced; sustainability incorporated into wording	Draft for submission to SGG
Rev. 2 Concept B	4 March 2015	The term "assessment criteria" replaced with the term "competency indicators"; the term "competency area" added to competency indicators and range statement	Draft for submission to SGG
Rev. 2 Concept C	29 April 2015	Cleaned up version; competency indicators moved to Appendix A	Draft for submission to SGG
Rev. 2 Concept D	29 May 2015	Logical improvements recommended by SGG implemented. Consensus on the inclusion of competency indicators could not be reached.	SGG draft for submission to the ESGB
Rev. 2 Concept E	29 July 2015	Minor editing – Final version for submission to parties involved and Council	Amended and approved by the ESGB
Rev. 2 Concept E	26 Nov 2015		Approved by Council
Rev. 2.1		Streamline and clarify illustration (Section 1) by removing confusing pointers. Introduction of a brief professional registration classification and experience standards. Replaced "Outcomes" with "Graduate attributes". From 2016, the "Exit Level Outcomes" were replaced in all new ECSA documents by "Graduate attributes" to be internationally compatible. Replaced "B-Tech" by the general term "NQF Level 7 qualification".	WG Members

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Rev. 3	11 Sep 2018	Approval	PDSGC
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The Competency Standard for:

Registration as a Professional Engineering Technologist

Revision 3 dated 11 September 2018 and consisting of 15 pages has been reviewed for adequacy by the Business Unit Manager and is approved by the Executive: Research, Policy and Standards (RPS).



 Business Unit Manager

14/02/2019

 Date



 Executive: RPS


14/02/2019

 Date

The definitive version of this policy is available on our website.

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APPENDIX A: EXEMPLIFIED ASSOCIATED COMPETENCY INDICATORS

The competency indicators presented here are typifying, not prescriptive.

Outcome 1

Competency indicators: A definition, an investigation and an analysis of broadly defined engineering problems within the competence area typified by the following performances is expected:

- perform or contribute to defining engineering problems, thus leading to an agreed definition of the problems to be solved;
- perform or contribute to investigating engineering problems, including collecting, organising and evaluating information; and
- perform or contribute to analysing engineering problems, using conceptualisation, justified assumptions, limitations and evaluation of results.


Outcome 2

Competency indicators: This outcome is normally demonstrated after the problem analysis that is defined in Outcome 1. Working systematically to reach a solution to a broadly defined problem typified by the following performances is expected:

- design/develop solutions to broadly defined engineering problems and check impacts and sustainability;
- systematically synthesise solutions and alternative solutions/approaches to the problem by analysing designs, correlating with requirements and including costs and impacts on outside parameters; and
- draw up detailed specification requirements and design documentation for implementation to the satisfaction of the client.

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Outcome 3

Competency indicators: This outcome is normally demonstrated in the course of the planning, investigation and operations that are confined to the competence area:

- apply engineering principles, practices, technologies and the theory of a NQF Level 7 qualification in the practice area;
- indicate a working knowledge of areas of practice that interact with the practice area to underpin teamwork; and
- apply knowledge related to finance, statutes, sustainability, safety and management.

Outcome 4

Competency indicators: The display of personal and work process management abilities confined to the competence area is expected:

- manage self, people, work priorities, processes and resources in broadly defined engineering work;
- provide evidence of role in planning, organising, leading and controlling broadly defined engineering activities; and
- provide evidence of knowledge in regard to conditions and the operation of contractors and demonstrate the ability to establish and maintain professional and business relationships.


Outcome 5

Competency indicators: The demonstration of effective communication is expected by providing evidence of the following:

- ability to write clear, concise and effective technical, legal and editorially correct reports;
- ability to issue clear instructions to stakeholders using appropriate language and communication skills; and

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- execution of oral presentations using structure, style, language, visual aids and supporting documents appropriate to the audience and the purpose.

Outcome 6

Competency indicators: This outcome is normally displayed in the course of evaluating and planning tasks within the competence area by providing evidence of the following:

- ability to identify interested and affected parties and their expectations in regard to interactions among technical, social, cultural, environmental and long-term sustainability considerations; and
- demonstration of measures taken to mitigate the negative effects of engineering activities.

Outcome 7

Competency indicators: This outcome is normally displayed by the following:

- identifying sustainable practices and applicable legal, regulatory, health and safety requirements and standards for the broadly defined engineering activity; and
- stating circumstances in which the applicant assisted in or demonstrated awareness in regard to the selection of saving and sustainable materials, components and systems in addition to identifying risk and applied risk management strategies.


Outcome 8

Competency indicators: Demonstration of sensitivity to ethical issues and the adoption of a systematic approach to resolving these issues is expected and typified by the following:

- confirmation of conversance with the ECSA Code of Conduct for registered persons;
- confirmation of operations that are compliant with the ECSA Code of Conduct for registered persons; and

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

Outcome 9

Competency indicators: Exhibition of judgement is demonstrated by the following:

- exercising judgement in arriving at a conclusion within the application of technologies and their interrelationship with other disciplines and technologies; and
- considering factors regarding risk, the consequences of the technology applied and the affected parties.

Outcome 10

Competency indicators: Responsibility is displayed by the following performance carried out within the competency area:

- consideration of engineering, social, environmental and sustainable development in discharging responsibilities for significant parts of one or more activities;
- advice sought from a responsible authority on matters outside the applicant's area of competence; and
- use of academic knowledge of at least NQF Level 7 combined with past experience in formulating decisions.

Outcome 11

Competency indicators: Self-development is managed by the following:

- adopting strategy independently to enhance professional development; and
- showing awareness of philosophy in regard to professional development.

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