


ENGINEERING COUNCIL OF SOUTH AFRICA <i>Standards and Procedures System</i>			 E C S A
Competency Standard for Registration as a Professional Engineering Technician			
Approved by Council: Under Review Joint Implementation Committee			
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1 Purpose

This document defines the competency required for registration with the Engineering Council of South Africa as a Professional Engineer. Section 2 defines the set of outcomes to be satisfied, together with typifying assessment criteria and range statements. Section 3 defines the general range of problem solving, engineering activities and required knowledge.

2 Outcomes that Demonstrate Competency

The candidate evidences the required competency demonstrating in an integrated manner, in a workplace context, the following outcomes within *well-defined engineering activities* and solving *well-defined engineering problems defined* in the General Range Statement.

Learning Outcome 1:

Define, investigate and analyse well-defined engineering problems

Assessment Criteria: The candidate is expected to perform a structured analysis of problems typified by the following performances:

1. Interprets the client's requirements leading to an agreed statement of requirements;
2. Clarifies requirements, drawing issues and impacts to client's attention;
3. Identifies design aspects standards, codes and procedures to be followed;
4. Gathers information required for problem analysis
5. Identifies acceptance criteria for work product;
6. Verifies that the design problem is amenable to solution by candidate's techniques;
7. Documents functional solution requirements and gains client acceptance.

Range Statement: The problem may be part of a larger engineering activity or may stand alone. The *client* is the party requesting the work and may be within or outside the business in which the candidate works. The client may be an engineer or engineering technologist in a larger project. The design problem is a *well-defined engineering problem* as defined in the General Range statement in the Stage 2 Engineering Technician Qualification Definition. The design problem is amenable to solution by established techniques practiced regularly by the candidate.

Learning Outcome 2:

Design or develop solutions to well-defined engineering problems.

Assessment Criteria: This outcome is normally demonstrated after a problem analysis as defined in outcome 1. The candidate is expected to work systematically to synthesise a solution to a problem, typified by the following performances:

1. Identify and analyze alternative approaches to meeting problem specification;
2. Seek advice on aspects of the proposal or design process that fall outside established practice or standards;
3. Plans tasks and selects methods to complete design process;
4. Performs design or solution synthesis tasks;

5. Assembles complete solution and reviews to check compliance with client's requirements;
6. Checks solution and impacts of solution on interested and affected parties;
7. Reviews documented design with client to obtain formal acceptance.

Range Statement: This activity may be preceded by a problem analysis phase as in Outcome 1. The solution is amenable to established methods, techniques or procedures within the candidate's practice area.

Learning Outcome 3: Comprehend and apply knowledge embodied in established engineering practices and knowledge specific to the jurisdiction in which he/she practices.

Assessment Criteria: This outcome is normally demonstrated in the course of design, investigation or operations. The candidate typically:

1. Displays mastery of established methods, procedures and techniques in the practice area;
2. Applies knowledge underpinning methods, procedures and techniques to support technician activities;
3. Displays working knowledge of areas that interact with the practice area;
4. Applies codified knowledge in related areas: financial, statutory, safety, management.
5. Uses Information technology effectively as required by the practice area.

Range Statement: Technical knowledge is that applicable to the practice area irrespective of location, supplemented by locally relevant knowledge, for example established properties of local materials. Jurisdictional knowledge includes legal and regulatory requirements as well as prescribed codes of practice.

Learning Outcome 4:

Manage part or all of one or more well-defined engineering activities.

Assessment Criteria: The candidate is expected to display personal and work process management abilities:

1. Manage self
2. Work effectively in a team environment
3. Manage people, work priorities, work processes and resources
4. Establish and maintain professional and business relationships

Range Statement: The team is in general multi-speciality or multidisciplinary. The candidate may manage an engineering operation or construction project. The engineering technician may be supervised by engineering technologists or engineers and may in turn supervise technicians, operators, artisans.

Learning Outcome 5:

Recognise the foreseeable social, cultural and environmental effects of well-defined engineering activities generally

Assessment Criteria: : This outcome is normally displayed in the course of analysis and solution of problems. The candidate typically follows an established procedure to:

1. Identify interested and affected parties and their expectations;
2. Identify environmental impacts of the engineering activity;
3. Propose measures to mitigate negative effects of engineering activity;
4. Communicate with stakeholders.

Range Statement: Impacts to be considered are generally those identified within the established methods, techniques or procedures used in the practice area.

Learning Outcome 6:

Meet all legal and regulatory requirements and protect the health and safety of persons in the course of his or her well-defined engineering activities.

Assessment Criteria: The candidate is expected to

1. Identify applicable legal, regulatory and health and safety requirements for the engineering activity;
2. Select safe and sustainable materials, components and systems, seeking advice when necessary;
3. Apply defined, widely accepted methods to identify and manage risk.

Range Statement: : Requirements include both explicitly regulated factors and those that arise in the course of particular methods, techniques and procedures. Persons whose health and safety are to be protected are both inside and outside the workplace.

Learning Outcome 7:

Conduct his or her engineering activities ethically

Assessment Criteria: The candidate is expected to be sensitive to ethical issues and adopt a systematic approach to resolving these issues typified by:

1. Identify the central ethical problem;
2. Identify affected parties and their interests;
3. Search for possible solutions for the dilemma, seeking advice as required;
4. Evaluate each solution using the interests of those involved, accorded suitable priority;
5. Select and justify solution that is best resolves the dilemma.

Range Statement: Ethical behaviour is at least that defined by the Code of Conduct.

Learning Outcome 8:

Exercise sound judgement in the course of well-defined engineering activities

Assessment Criteria: A candidate exhibits judgement by:

1. Considers a limited number factors, some of which may not be well defined;
2. Considers the interdependence, interactions and relative importance of limited number of factors;
3. Foresees consequences of actions;
4. Evaluates a situation in the absence of full evidence;
5. Draw on experience and knowledge.

Range Statement: Judgement is expected both within the application of the candidate's methods, techniques and procedures and in assessing their immediate impacts.

Learning Outcome 9:

Be responsible for making decisions on part or all of all of one or more well-defined engineering activities

Assessment Criteria: The candidate displays responsibility by performance of:

1. Demonstrates a professional approach at all times;
2. Conduct engineering technician activities to an ethical standard at least equivalent to the relevant code of conduct;
3. Has due regard to social, environmental and sustainable development considerations;
4. Takes advice from a responsible authority on any matter considered to be outside applicable standards and codes;
5. Evaluates work output, revises as required and takes responsibility¹ for work output.

Range Statement: The candidate is expected to discharge responsibility for significant parts of a one or more *well-defined engineering activity*.

Note 1: The candidate in demonstrating responsibility would under supervision of a competent engineering practitioner but is expected to perform as if he/she is in a responsible position.

Learning Outcome 10: Communicate clearly with others in the course of his or her well-defined engineering activities

Assessment Criteria: The candidate demonstrates effective communication by:

1. Write clear, concise, effective, technically, correct reports using a structure and style which meets communication objectives and user/audience requirements.
2. Read and evaluate technical and legal matter relevant to the technical function
3. Receive instructions, ensuring correct interpretation.
4. Issue clear instructions to subordinates using appropriate language and communication aids, ensuring that language and other communication barriers are overcome.
5. Make oral presentations using structure, style, language visual aids and supporting documents appropriate to the audience and purpose.

Range Statement: Material relates to technical/project progress information, verbal and written instructions to staff. Formats for documents are defined. While the assessment criteria are similar to those at Stage 1, the Stage 2 Engineering Technician is expected to perform the communication functions reliably and repeatably.

Learning Outcome 11: Undertake independent learning activities sufficient to maintain and extend his or her competence

Assessment Criteria: The candidate manages his or her own professional development by typically:

1. Plans own professional development strategy in collaboration with employer or mentor
2. Selects appropriate professional development activities;
3. Keeps record of professional development strategy and activities;
4. Displays independent learning ability
5. Completes professional development activities.

Range Statement: In proceeding from Stage 1 to Stage 2, the candidate must bear this competency standard in mind in developing the strategy and selecting activities. A candidate in a structured programme is expected to take ownership of the strategy.

3 General Range Statement:

Practice Area:

Each engineering technician, by the time of reaching the point of assessment against this standard, will have followed a programme of education, training and experience that may conform to an established pattern or may be distinctive. Each individual therefore develops an area of knowledge and expertise that may be distinctive. This pattern of knowledge and expertise is termed the individual's *practice area*.

Well-defined Engineering Activities: are characterized by:

- Contribute to one or more of: design; planning; investigation and problem resolution; improvement of materials, components, systems or processes; engineering operations; project management; project implementation; research, development and commercialisation.
- *Boundaries* of practice area are defined by techniques applied; change by adopting new techniques into current practice; opportunities to improve practice are referred to engineers or technologists or relevant stakeholders.
- Practice area is located within a wider, complex *context*, with well defined working relationships with other parties and disciplines

- Work involves familiar, defined range of *resources* (including people, money, equipment, materials, technologies), risks are well defined
- Require resolution of *interactions* manifested between specific technical factors with limited impact on wider issues
- *Constrained* by operational context, defined workpackage, time, finance, infrastructure, resources, facilities, standards & codes, applicable Laws

Well-defined Engineering Problems: are characterized by:

- Are discrete, focussed tasks within engineering systems
- Problems are routine, may be unfamiliar but in familiar context; problem definitions require clarification.
- Information is concrete and largely complete, but requires checking and possible supplementation
- Can be solved in standardized or prescribed ways
- Involve several issues but with few of these imposing conflicting constraints
- Are frequently encountered and thus familiar to most practitioners in the practice area
- Problems are encompassed by standards, codes and documented procedures; only work outside their prescriptions with authorisation
- Involve a limited range of interested and affected parties with differing needs
- Have consequences which are locally important but not far reaching
- Requires practical judgment in practice area in evaluating solutions, considering interfaces to other roleplayers

Knowledge:

1. Selection of: practical knowledge in applicable law, regulation, codes, quality systems, project management procedures, construction management, maintenance procedures, maintenance management.
2. Working knowledge in disciplines requesting work and receiving outputs relating to pivotal contribution of techniques to the system (rather than detailed design)
3. Experience of a range of well-defined engineering activities in the practice area.

4 Revision History

Version	Date	Status/Authorised by	Nature of Revision
Rev 0: Draft 6	28 Feb 2006	Approved by Council	Taken over from SGG
Rev 0: Draft 6.1	30 Jan 2007	JIC Working Document	Converted to new document ID