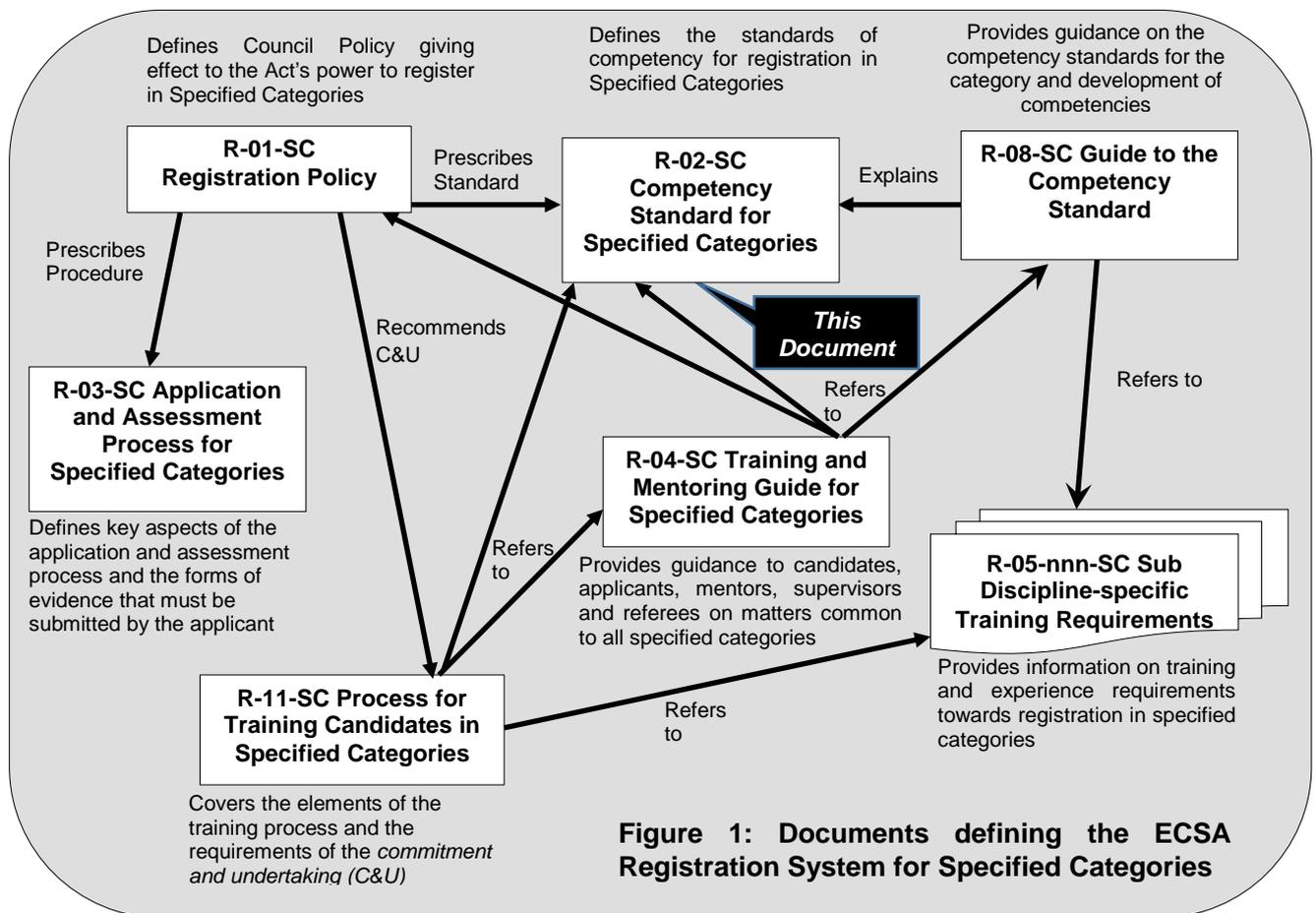


ENGINEERING COUNCIL OF SOUTH AFRICA <i>Standards and Procedures System</i>			 ECSA
Competency Standard for Registration in a Specified Category			
Status: Approved by Council			
Document : R-02-SC	Rev 2 Concept D	26 November 2015	

Background: The ECSA Registration System Documents

The documents that define the Engineering Council of South Africa (ECSA) system for registration in specified categories are shown in Figure 1 which also locates the current document.



1. Purpose of this document

- 1.1 This standard defines the competence required for registration in a Specified Category. Acronyms and definitions of terms having particular meaning within this standard are given in text in Appendix A. The Competency Indicators are listed in Appendix B.

Note: The term ***specifically-defined engineering*** below may be interchanged with the specific category designation, i.e. Lift Inspector, Lifting Machinery Inspector, Medical Equipment Maintainer, Fire Protection Systems Inspector, or any future specified category prescribed by the Council.

2. Demonstration of Competence

2.1 Competence must be demonstrated within ***specifically-defined engineering*** activities, defined below, by integrated performance of the outcomes defined in section 3 at the level defined for each outcome. Required contexts and functions may be referred to as guidelines and as mandatory requirements the applicable Discipline Specific Training Requirements (e.g. R-05-LMI-SC, etc.).

2.1.1 Level Descriptor: ***Specifically-defined engineering activities are characterized by several or all of:***

- a) Scope of specific practice area is defined by specific techniques applied; change by adopting new specific techniques into current practice;
- b) Practice area is located within a wider, complex *context*, with specifically-defined working relationships with other parties and disciplines;
- c) Work involves specific familiar *resources*, including people, money, equipment, materials, technologies;
- d) Require resolution of *interactions* manifested between specific technical factors with limited impact on wider issues;
- e) Are *constrained* by operational context, defined work package, time, finance, infrastructure, resources, facilities, standards and codes, applicable laws;
- f) Have *risks* and *consequences* that are locally important but are specifically defined.

2.1.2 ***Activities*** include but are not limited to: planning; investigation and problem resolution; improvement of materials, components, systems or processes, engineering operations, maintenance, project management, development and commercialisation.

3. Competency Standards

Group A Outcomes: Engineering Problem Solving.

3.1 Outcome 1:

Define, investigate and analyse ***specifically-defined engineering*** problems (tasks)

3.1.1 Level Descriptor: ***Specifically-defined engineering problems have the following characteristics:***

- (a) can be solved mainly by specific practical engineering knowledge, underpinned by related theory;
and one or more of:
- (b) are fully defined but require feedback;
- (c) are discrete, specifically focused tasks within engineering systems;
- (d) are routine, frequently encountered and in familiar specified and sustainable context;
and one or more of:
- (e) can be solved by standardized or prescribed ways;
- (f) are encompassed by specific standards, codes, legislation and documented procedures; requires authorization to work outside limits;

- (g) information is concrete, specific and largely complete, but requires checking and possible supplementation;
- (h) involve specific issues but few of these imposing conflicting constraints and a specific range of interested and affected parties;
and one or both of:
- (i) requires practical judgement in specific practice area in evaluating solutions, considering interfaces to other role-players;
- (j) have consequences which are locally important but within a specified category (wider impact are dealt with by others).

3.1.2 Range Statement: The problem (task) may be part of a larger engineering activity or may be stand alone. The design (planning) problem is amenable to solution by established specific techniques practiced regularly. This outcome is concerned with the understanding of a problem: Outcome 2 is concerned with the solution.

3.2 Outcome 2:

Design, develop, plan or practice solutions to **specifically-defined engineering** problems (tasks).

3.2.1 Range Statement: The solution conforms to specific established methods, techniques or procedures within the specifically-defined competence area.

3.3 Outcome 3:

Comprehend and apply knowledge embodied in established specific engineering practices and knowledge specific to the field in which he/she practices.

3.3.1 Range Statement: Applicable knowledge includes:

- (a) Technical knowledge that is applicable to the specific practice area irrespective of location, supplemented by locally relevant knowledge, for example established properties of local materials.
- (b) A working knowledge of interacting disciplines confined to the competence area. Codified knowledge in related areas: financial, statutory, safety, management and sustainability.
- (c) Jurisdictional knowledge includes legal and regulatory requirements as well as prescribed codes of practice.

Group B Outcomes: Managing Engineering Activities.

3.4 Outcome 4:

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

3.5 Outcome 5:

Communicate clearly with others in the course of his or her **specifically-defined** engineering activities

3.5.1 Range Statement for Outcomes 4 and 5: Management and communication in ***specifically-defined engineering*** involves:

- (a) Planning activities;
- (b) Organising activities;
- (c) Leading activities;
- (d) Implementing activities; and
- (e) Controlling activities.

Communication relates to technical aspects and wider impacts of professional work. Audience includes peers, other disciplines, clients and stake-holders audiences. Appropriate modes of communication must be selected. The Specified Category practitioner is expected to perform communication functions reliably, repeatedly, and within his or her competency area.

Group C: Impacts of Engineering Activity.

3.6 Outcome 6:

Recognise the foreseeable social, cultural, environmental and sustainability effects of ***specifically-defined*** engineering activities generally

3.7 Outcome 7:

Meet all legal and regulatory requirements, protect the health and safety of persons and adhere to sustainable practices in the course of his or her ***specifically-defined*** engineering activities.

3.7.1 Range Statement for Outcomes 6 and 7: Impacts and regulatory requirements include:

- (a) Impacts to be considered are generally those identified within the established methods, techniques or procedures used in the specific practice area;
- (b) Regulatory requirements are prescribed;
- (c) Apply prescribed risk management strategies;
- (d) Effects to be considered and methods used are defined;
- (e) Prescribed safe and sustainable materials, components and systems;
- (f) Prescribed maintenance protocols;
- (g) Persons whose health and safety are to be protected are both inside and outside the workplace.

Group D Outcomes: Exercise judgment, take responsibility, and act ethically.

3.8 Outcome 8:

Conduct engineering activities ethically.

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

3.9 Outcome 9:

Exercise sound judgement in the course of ***specifically-defined*** engineering activities

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

- (a) taking specific category risk factors into account; **and**
- (b) consequences in the immediate work contexts; **and**
- (c) identifying a set of interested and affected parties with defined needs to be taken into account, including needs for sustainability.

3.10 Outcome 10:

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

3.10.1 Range Statement: Responsibility must be discharged for significant parts of one or more ***specifically-defined*** engineering activity.

Note 1: Responsible for the evaluation of work output in a supervisory capacity.

Group E Outcomes: Continuing Professional Development

3.11 Outcome 11:

Undertake independent learning activities sufficient to maintain and extend his or her competence

3.11.1 Range Statement: Professional development involves:

- (a) Taking ownership of own professional development;
- (b) Planning own professional development strategy;
- (c) Selecting appropriate professional development activities; and
- (d) Recording professional development strategy and activities; while displaying independent learning ability.

Appendix A: Acronyms and Definitions

“**Competency area**” means the performance area where all the outcomes can be demonstrated at the level prescribed in a specific technology in an integrated manner.

“**Competency Indicators**” means the typifying guide to evidence indicating competence and is not normative.

“**Continuing Professional Development**” means the systematic, 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 an engineering practitioner’s career.

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

“**Engineering problem**” means a problematic situation that is amenable to analysis and solution using engineering sciences and methods.

“**Ill-posed problem**” means problems whose requirements are not fully defined or may be defined erroneously by the requesting party.

“**Integrated performance**” means that an overall satisfactory outcome of an activity 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**” means a measure of performance demands at which outcomes must be demonstrated.

“**Management of engineering works or activities**” means the co-ordinated activities required to:

- (i) direct and control everything that is constructed or results from construction or manufacturing operations;
- (ii) operate engineering works safely and in the manner intended;
- (iii) return engineering works, plant and equipment to an acceptable condition by the renewal, replacement or mending of worn, damaged or decayed parts;
- (iv) direct and control engineering processes, systems, commissioning, operation and decommissioning of equipment;
- (v) maintaining engineering works or equipment in a state in which it can perform its required function.

“**nnn**” means an acronym for the next specified category to be introduced, e.g BI for Building Inspectors.

“**Outcome**” at the *specified category practitioner* level means a statement of the performance that a person must demonstrate in order to be judged competent to operate in a competency area.

“**Over-determined problem**” means a problem whose requirements are defined in excessive detail, making the required solution impossible to attain in all of its aspects.

“Practice area” means a generally recognised or distinctive area of knowledge and expertise developed by an engineering practitioner by virtue of the path of education, training and experience followed.

“R” means Registration.

“Range statement” means 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.

“SC” means Specified Category

“Specified Category” means a category of registration created for persons who must be registered through the Engineering Profession Act or a combination of the Engineering Profession Act and external legislation as having specific engineering competencies normally at NQF 5 or better, related to an identified need to protect the public safety, health and interest of the environment, in relation to an engineering activity.

“Sustainable development” means development that meets the needs of the present without compromising the ability of future generations to meet their own needs. Engineering should look not only to decrease impacts, but also to restore and regenerate through design.

Appendix B: Exemplified Associated Competency Indicators

The competency indicators presented here are typifying, not normative.

Outcome 1:

A definition, investigation into and analysis of **specifically-defined engineering** problems (tasks) within the competence area, typified by the following performances, is expected:

- 1.1 Understand the activity as agreed to with the client.
- 1.2 Analyse and clarify information, drawings, codes, procedures, etc.

Outcome 2:

This outcome is normally demonstrated after a problem (task) analysis as defined in outcome 1. Working systematically to reach a solution to a **specifically-defined** problem (task), typified by the following performances is expected:

- 2.1 Develop and analyse alternative approaches to do the work. Check impacts and sustainability.
- 2.2 Final solution to perform the work stated, client or your supervisor in agreement.

Outcome 3:

This outcome is normally demonstrated in the course of planning, investigation or operations confined to the competence area by using:

- 3.1 At least Higher Certificate level engineering standard procedures and systems to execute the work, and at least Higher Certificate level theory applied to understand and/or verify these procedures
- 3.2 At least Higher Certificate level theoretical calculations and/or reasoning on why the application of this theory is considered to be correct.

Outcome 4:

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

- 4.1 Managed self, priorities, processes and resources in doing the work.
- 4.2 Role and contribution in the work team evident.

Outcome 5:

Demonstrates effective communication by providing evidence of:

- 5.2 Presenting your point of view and compiling reports after completion of the work.
- 5.3 Compile and issue instructions to subordinates working on the same task.

Outcome 6:

This outcome is normally displayed in the course of evaluating and planning tasks within the competence area, by typically providing by typically:

- 6.1 Identifying affected parties, environmental impacts and the long term sustainability of the engineering activity;
- 6.2 Proposing mitigating measures and communicate on measures to stakeholders.

Outcome 7:

- 7.1 Identify applicable legal, regulatory, health and safety requirements and standards and sustainable practices for the ***specifically-defined*** engineering activity;
- 7.2 Managing risks and use safe and sustainable materials, components and systems, seeking advice when necessary.

Outcome 8:

Sensitivity to ethical issues and the adoption of a systematic approach to resolving these issues is expected, typified by:

- 8.1 Identified ethical issues and affected parties and their interest and action taken when a problem arose.
- 8.2 Confirm conversance and compliance with ECSA's Code of Conduct and why this is important in doing work.

Outcome 9:

Exhibition of judgement is demonstrated by:

Exhibition of judgement is expected by:

- 9.1 Considering specific factors applicable to the category and how they are interrelated;
- 9.2 Foreseeing consequences of actions, evaluating a situation in the absence of full evidence

Outcome 10:

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

- 10.1 Use of at least Higher Certificate level theoretical calculations to justify decisions taken in doing engineering work. Attach actual calculations
- 10.2 Take responsible advice on any matter falling outside own education and experience.
- 10.3 Take responsibility for own work and evaluate any shortcoming in output

Outcome 11:

Self-development is managed by typically:

- 11.1 Strategy independently adopted to enhance own development.
- 11.2 Philosophy of employer in regard to development realised.

Revision History

Version	Date	Revision Authorized by	Nature of revision
Rev 0 Concept A	28 July 2012	Technician Registration Committee	First Draft
Rev 0 Concept B	23 July 2013	SGG Specified Categories	Revisions as per SGG meeting of 19 July 2013.
Rev 0 Concept C	12 September 2013	SGG Specified Categories	Input from JIC and CRC incorporated. Approved by SGG Specified Categories.
Rev 0 Concept D	17 September 2013	ESGB	Rev 0 Concept C approved by ESGB
Rev 0 Concept E	20 September 2013	ESGB	Typing mistakes corrected
Rev 1	22 November 2013	Approved by Council	
Rev 2 Concept A	28 December 2014	SGG Specified Categories	Figure 1 added. Sustainability incorporated in wording.
Rev 2 Concept B	9 April 2015	SGG Specified Categories	"Assessment Criteria" re-designated "Competency Indicators". The term "Competency Area" added to Competency Indicators and Range Statement.
Rev 2 Concept C	29 May 2015	SGG draft for submission to the ESGB	Logical improvements recommended by the SGG implemented. Consensus on the inclusion of Competency Indicators could not be reached
Rev 2 Concept D	29 July 2015	Amended and approved by the ESGB	Minor editing – final version for submission to parties involved and Council.
Rev 2 Concept D	26 November 2015	Approved by Council	
<hr/> ECSA CONTROLLED COPY <hr/>		Executive: Policy Development and Standards Generation	 <hr/> John Cato 2016-08-17 <hr/> Date