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BOARD NOTICE

BOARD NOTICE 206 OF 2013

Engineering Council of South Africa

Invitation to Comment on the Proposed ECSA Specified Category Qualification Standards

ECSA

1. Background

The qualifications attached were developed to augment the existing HEQF compliant Level 5 Higher Certificate in Engineering by providing further detail on the Type B version to make provision for designated Specified Categories as provided for in Engineering Professions Act (Act 46 of 2000) Clause 18(1)(c). The Higher Certificate in Engineering for Specified Categories is supplemented by Discipline Specific Criteria under Exit Level Outcome 5 for the existing Specified Categories regcognised by ECSA, and further additions will be made for each additional Specified Category recognised in future. The final document, Competency Standards for Registration in a Specified Category details the generic standards to be met for ECSA registration. The following information is found in the policy:

- Makes the HEQF an integral part of the NQF
- It is based on a 10-level NQF
- Sets common parameters and criteria for the design of higher education qualifications.

The attached qualifications are:

NO.	TITLE	LEVEL	CREDIT(S)	EDUCATIONAL REQUIREMENT
1	Higher Certificate in Engineering for Specified Categories	05	140	Specified Category
2	Higher Certificate in Engineering for Specified Categories, Exit Level 5 Discipline Specific Criteria	05	Included in the above	Specified Category
3	Competency Standards for Registration in a Specified Category	05	Not Applicable	Registered Specified Category

2. QUALIFICATIONS GENERATION PROCESS

The Engineering Standards Generating Body (ESGB) undertook the work of developing the Higher Certificate in Engineering for Specified Categories and Competency Standards Qualifications for Registration in a Specified Category in **Standards Generating Groups**. These Standards Generating Groups comprised of an ESGB member as chairperson and technical experts from each existing Specified Category, and other stakeholders (including providers, industry, professional institutes, and state departments).

3. PURPOSE FOR THE PROCESS

The Strategic Advisory Committee of ECSA, has recognised the need for developing standards for Specified Categories qualifications aligned to the Revised HEQF. This has come about for the following reasons.

- The need to provide an attractive career path to students entering engineering via the FET colleges.
- The provision of a sound underpinning engineering knowledge to Specified Category practitioners towards ECSA registration.

The proposed standards resulting from this process is now published for comment. A revision will be made as a result of the comments and the document put to the ECSA Council for approval. The Higher Certificate standards and the Competency Standards for Registration rely on the ECSA policy document E-01-P and Policy on the Registration of Specified Categories respectively: Background the Accreditation of Engineering Programmes for definitions and the definition of the formula for calculating credits.

4. SUBMISSION OF COMMENTS

Interested parties are requested to submit comments not later than **Wednesday 30 October 2013** by e-mail to the ECSA Education Manager, Samantha Naidoo at Samantha@ecsa.co.za.

ENGINEERING COUNCIL OF SOUTH AFRICA *Standards and Procedures System*			ECSA
Qualification Standard for Higher Certificate in Engineering for Specified Categories: NQF Level 5			
Status: ESGB Working Document.			
Document: E-07-SC	**Draft 4**	**17 September 2013**	

Background: The ECSA Education System Documents

The documents that define the Engineering Council of South Africa (ECSA) system for accreditation of programmes meeting educational requirements for professional and specified categories are shown in Figure 1 which also locates the current document.

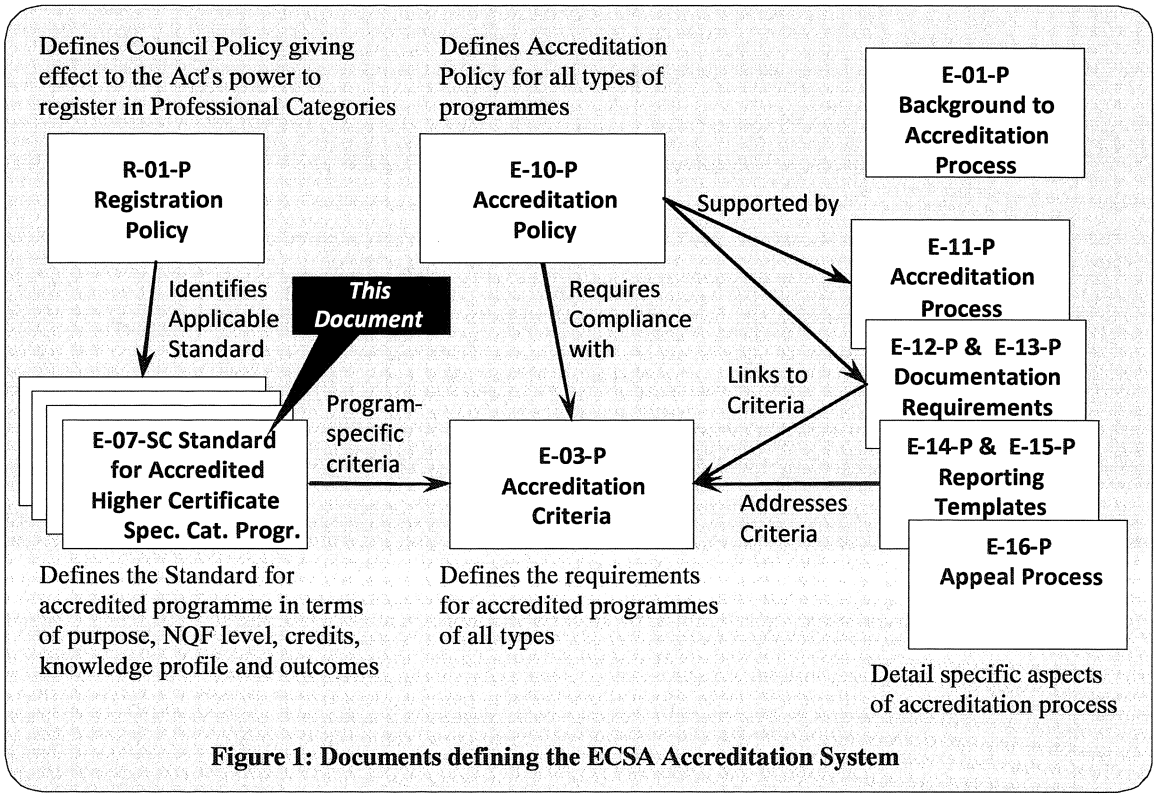

Figure 1: Documents defining the ECSA Accreditation System

1. Purpose

This document defines the standard for accredited Higher Certificate in Engineering-type programmes for Specified Categories in terms of programme design criteria, a knowledge profile and a set of exit level outcomes. This standard is referred to in the Accreditation Criteria defined in ECSA document E-03-P.

2. HEQF and NQF Specification

Field: Manufacturing, Engineering and Technology
Sub-Field: Engineering and Related Design
NQF Level: Level 5
Credits: 140 credits total; Not less than 120 Credits shall be at NQF level 5
Acceptable titles: Higher Certificate in Engineering
Abbreviation: H Cert (Engineering)
Qualifiers: See section 3

3. Qualifiers

The qualification must have a qualifier(s) defined in the provider's rules for the Higher Certificate and reflected on the academic transcript and Higher Certificate, subject to the following:

1. There must be at least one qualifier which contains the word engineering together with a disciplinary description such as: Lift Inspector, Lifting Machinery Inspector, Medical Equipment Maintainer, Fire Protection Systems Inspector or any future Specified Category prescribed by the Engineering Council of South Africa.
2. A second qualifier(s), if present, must indicate a focus area or areas within the field of the first qualifier such as: Lifts, Escalators, Chain Blocks and Lever Hoists, Forklifts, Mobile Cranes, Overhead and Gantry Cranes, Tower Cranes, Ships Cranes, Wharf Side Cranes, Reach Stackers, Straddle Carriers, Container Cranes, Aerial Platforms, Suspended Access Platforms, Industrial Lifting Devices, Under the Hook Lifting Devices, Tail Lifters, Vehicle Hoists, Mechanical Medical Equipment, Electro-medical Equipment, Respiratory and Anaesthesia Equipment, Medical Imaging Equipment, Fire Alarm and Detection, Passive Fire Protection, Aerosol Fire Extinguishing, Water Sprinklers, Powder Fire Extinguishing, Foam Fire Extinguishing, Electrical Smoke Control, Mechanical Smoke Control, Mechanical Fixed Gaseous Fire Extinguishing, Mechanical Fixed Gaseous Fire Extinguishing or any future Focus Area prescribed by the Engineering Council of South Africa.
3. The qualifier(s) must:
    - clearly indicate the nature and purpose of the programme;
    - be consistent with the fundamental engineering science content on the programme;
4. The target market indicated by the qualifier(s) may be a traditional discipline of engineering or a branch of engineering or a substantial industry area or in a specified area of practice. Formal education for niche markets should be satisfied by broad undergraduate programmes such as specified in this standard followed by specialized course-based programmes.

In the case of a provider offering programmes with different titles but having only minor differences in content or undifferentiated purposes, only one programme should be accredited.

Examples of acceptable qualification titles in accordance with the HEQF policy are:

- Higher Certificate in Engineering Lifting Machinery Inspection, abbreviated H Cert. (Engineering Lifting Machinery Inspection)

In case of a second *Qualifier*:

- Higher Certificate in Engineering Fire Protection Systems Inspection in Electrical Smoke Control, abbreviated, H Cert. (Engineering Fire Protection Systems Inspection) (Electrical Smoke Control)

- Higher Certificate in Engineering Medical Equipment Maintenance in Medical Imaging Equipment, abbreviated H Cert. (Engineering Medical Equipment Maintenance) (Medical Imaging Equipment)

4. Purpose of the Qualification

The qualification is primarily vocational or occupational in nature. The qualification also serves to provide students with the basic introductory knowledge, cognitive and conceptual tools and practical skills for further higher education studies in their chosen field of study. The knowledge emphasizes general principles and application. This qualification signifies that the student has attained a basic level of higher education knowledge and competence in a particular field or occupation and is capable of applying such knowledge and competence in an occupation or role in the workplace.

Specifically the purpose of educational programmes designed to meet this qualification are to build the necessary knowledge, understanding, abilities and skills required for further learning towards becoming a competent practicing Engineering Technician. This qualification provides:

1. Preparation for careers in engineering and areas that potentially benefit from engineering skills, for achieving technical proficiency and to make a contribution to the economy and national development;
2. The educational base that may be required for registration in a Specified Category with ECSA. (refer to qualification rules).
3. Entry to programmes e.g. Advanced Certificate, Diploma or Bachelor Degree Programme

Engineering students completing this qualification will demonstrate competence in all the Exit Level Outcomes contained in this standard.

5. Rationale

Work done by practitioners in the Support Occupations is characterized by their ability to apply proven, commonly understood detailed techniques procedures, practices and codes to solve *specifically-defined* engineering problems. They manage and supervise specific engineering operations, construction and activities. They work independently and responsibly within a specified allocated area or under supervision.

Support Occupation practitioners must therefore have a detailed understanding of engineering sciences supporting the specific techniques used, together with financial, commercial, legal, social economic, health, safety and environmental methodologies and specific best practices.

The process of professional development of Support Occupation practitioner starts with the attainment of a qualification that meets this standard. After graduation a programme of detailed training and experience is completed to attain the competencies for registration in a specified category.

6. Programme Structure

The programme leading to the qualification shall contain a minimum of 140 credits, with not less than 120 credits at NQF level 5. Credits shall be distributed in order to create a coherent progression of learning toward the exit level.

6.1 Knowledge Profile of the Graduate

The content of the educational programme when analysed by knowledge area shall not fall below the minimum credits in each knowledge area as listed below:

Table 1: Minimum credits in knowledge areas	Type B
Total	140
Mathematical Sciences	7
Natural Sciences	7
Engineering Sciences	56
Engineering Design & Synthesis	7
Computing and IT	14
Complementary Studies	7
Specified Category Discipline	21
Available for re-allocation in above areas	21

Type B indicates the minimum credits requirement for this qualification that leads to engineering support occupations. The Specified Categories Discipline credits are allocated to provide the underpinning knowledge in the specific discipline as detailed for the particular Specified Category on ECSA's website e.g. Lift Inspectors, Lifting Machinery Inspectors, Medical Equipment Maintainers, Fire Protection System Inspectors, or any future Specified Category prescribed by the Council. The reallocation credits may be assigned to any of the six knowledge areas to meet the specifics of an engineering support occupation.

The method of calculation of credits and allocation to knowledge area is defined in ECSA document E-01-P or Appendix A.

6.2 Core and Specialist Requirements

The programme shall have a coherent core of mathematics, natural sciences and engineering sciences totalling not less than 50% of the total credits that provides a viable platform for further studies and lifelong learning. The coherent core must enable development in a traditional discipline, sub-discipline or in an emerging field. The coherent core includes fundamental elements. The provider may allow elective credits, subject to the minimum credits in each knowledge area and the exit level outcomes being satisfied for all choices.

A programme shall contain specialist engineering study at the exit level. Specialist study may lead to elective or compulsory credits. Specialist study may take on many forms including further deepening of a theme in the core, a new sub-discipline, or a specialist topic building on the core. It is recognized that the extent of specialist study is of necessity limited in view of the need to provide a substantial coherent core. Specialist study may take the form of compulsory or elective credits.

In the Complementary Studies area, it covers those disciplines outside of engineering sciences, natural sciences and mathematics which are relevant to the practice of engineering in two ways: (a) principles, results and method are applied in the practice of engineering, including engineering economics, the impact of technology on society and effective communication; and (b) study broadens the student's perspective in the humanities or social sciences to support an

understanding of the world. Underpinning Complementary Studies knowledge of type (b) must be sufficient and appropriate to support the student in satisfying Exit Level Outcomes 6, 7 and 10 in the graduates specialized practice area.

6.3 Curriculum Content

This qualification does not specify detailed curriculum content. The fundamental and specialist engineering science content must be consistent with the designation of the qualification.

Designers of specific qualifications may build on this generic base by specifying occupation-related content and specific skills required. The particular occupation may also require other qualifications, learner ships, skills programmes or further learning.

6.4 Work Integrated Learning

Should a provider elect to include work integrated learning (WIL) credits in the programme, the provider must ensure that all students must undertake work-integrated learning.

7. Access to Qualification

This standard is specified as a set of exit level outcomes and overall distribution of credits. Providers therefore have the freedom to construct programmes geared to different levels of preparedness of learners, including:

- Use of access programmes for learners who do not meet the minimum requirements;
- Creating articulation paths from other qualifications.

8. Minimum Learning Assumed to be in Place

The minimum entry requirement is the National Senior Certificate or the National Certificate (Vocational) (level 4) or the N6 certificate (NATED) with appropriate subject combinations and levels of achievement, as defined in the Government Gazette, Vol 751, No 32131 of 11 July 2008, and in the *Government Gazette,* Vol. 533, No. 32743, November 2009. Alternatively, a Higher Certificate or an Advanced Certificate or Diploma in a cognate field may satisfy the minimum admission requirements.

Note: Appropriate Language, Mathematics and Physical Science are required at NQF level 4.

9. Exit Level Outcomes

Exit level outcomes defined below are stated generically and may be assessed in various engineering disciplinary or cross-disciplinary contexts in a provider-based or simulated practice environment. Words and phrases having specific meaning are defined in this document or in the ECSA document E-01-P.

Notes:

1. For Critical Crossfield Outcomes linked to Exit Level Outcomes refer to normative information in Appendix B.
2. For exemplified informative associated assessment criteria, refer to Appendix C.
3. The Level Descriptor: *Specifically-defined engineering problems* applicable to this Qualification Standard is characterised by:
    a. can be solved mainly by specific practical engineering knowledge, underpinned by related theory;

and one of:

b. are fully defined but require feedback;
c. are discrete, specifically focussed tasks within engineering systems;
d. are routine, frequently encountered and in familiar specified context;

and one or more of:

e. can be solved in standardized or prescribed ways;
f. are encompassed by specific standards, codes 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.

General Range Statement: The competencies defined in the ten exit level outcomes may be demonstrated in a provider-based and / or simulated workplace context.

Exit Level Outcome 1: Problem solving

Apply engineering principles to systematically diagnose and solve *specifically-defined* engineering problems.

Exit Level Outcome 2: Application of scientific and engineering knowledge

Apply knowledge of mathematics, natural science and engineering sciences to wide practical procedures and practices to solve *specifically-defined* engineering problems.

Range Statement: Knowledge of mathematics, natural science and engineering science is characterized by:

1. A coherent range of fundamental principles in mathematics and natural science underlying a sub-discipline or recognised practice area.
2. A coherent range of fundamental principles in engineering science and technology underlying an engineering sub-discipline or recognised practice area.
3. A codified practical knowledge in recognised practice area.
4. The use of mathematics, natural sciences and engineering sciences, supported by established mathematical formulas, codified engineering analysis, methods and procedures to solve *specifically-defined* engineering problems.

Exit Level Outcome 3: Engineering Design

Perform procedural design of *specifically-defined* components or processes to meet desired needs within applicable standards, codes of practice and legislation.

Range Statement: Design problems used in assessment must conform to the definition of *specifically-defined* engineering problems.

Exit Level Outcome 4: Investigation

Conduct tests, experiments and measurements of *specifically-defined* engineering problems by applying relevant codes and manufacturer guidelines.

Range Statement: The task should be appropriate to the discipline.

Exit Level Outcome 5: Engineering methods, skills, tools, including Information technology

Use appropriate established techniques, resources, and modern engineering tools including information technology for the solution of *specifically-defined* engineering problems, with an awareness of the limitations.

Note: Demonstrate knowledge and understanding on the conduct of specialised work including tests and inspections on specific machinery, systems, operations, procedures and associated equipment.

Range Statement: A range of established methods, skills and tools appropriate to the sub-discipline of the program including:

1. Sub-discipline-specific tools, processes or procedures.
2. Computer packages for computation and information handling;
3. Computers and networks and information infrastructures for accessing, processing, managing, and storing information to enhance personal productivity and teamwork;
4. Basic techniques from economics, management, and health, safety and environmental protection.
5. Machinery as defined in the Regulations of the Occupational Health and Safety Act (Act No 85 of 1993), SANS codes, International Codes of Practice and Manufacturers Installation and Maintenance Instructions.

Exit Level Outcome 6: Professional and Technical Communication

Communicate effectively, both orally and in writing within an engineering context.

Range Statement: Material to be communicated in the following context:

1. Audiences are engineering peers, academic personnel and related engineering persons using prescribed formats.
2. Written reports range from 300-2000 words plus tables, diagrams and appendices.
3. Methods of providing information include the conventional methods of the discipline, for example engineering drawings and sketches.

Exit Level Outcome 7: Impact of Engineering Activity

Demonstrate knowledge and understanding of the impact of engineering activity on society and the environment.

Range Statement: The combination of social and environmental factors must be appropriate to the discipline or sub-discipline of the qualification. Evidence may include examples of situations in which the graduate is likely to participate.
Issues and impacts to be addressed:

1. Are encompassed by standards and documented codes of practice; and
2. Are *specifically-defined,* discrete and part of an engineering system.

Exit Level Outcome 8: Individual and Teamwork

Demonstrate knowledge and understanding of basic engineering management principles.

***Range Statement*:**

1. Tasks are discipline or sub-discipline specific and within the technical competence of the graduate.
2. Management principles include:
3. Planning: set objectives and review achievement.
4. Organising: identify and organize tasks. Recognise responsibilities.
5. Leading: set example, communicate, motivate.
6. Controlling: monitor own performance and check against standards.

Exit Level Outcome 9: Independent Learning

Engage in independent and life-long learning.

***Range Statement*:** Information relevant to the assigned task is sourced and organised.

Exit Level Outcome 10: Engineering Professionalism

Understand and commit to ethics, responsibilities and norms of engineering practice.

***Range Statement*:** Evidence includes case studies, memorandum of agreement, code of conduct, membership of professional societies etc typical of engineering practice situations in which the graduate is likely to participate

10. Integrated Assessment

Providers of programmes shall in the quality assurance process demonstrate that an effective integrated assessment strategy is used. Clearly identified components of assessment must address summative assessment of the exit level outcomes. Evidence should be derived from major work or multiple instances of limited scale work.

11. Recognition of Prior Learning

Recognition of prior learning (RPL) may be used to demonstrate competence for admission to this programme. This qualification may be achieved in part through recognition of prior learning processes. Credits achieved through RPL must not exceed 50% of the total credits and must not include credits at the exit level.

12. Articulation Possibilities

Completion of the Higher Certificate, Type B, meets part of the minimum entry requirement for admission to an appropriate Advanced Certificate. Accumulated credits may also be presented for admission into a cognate Diploma. A Higher Certificate may also allow access to an appropriate Bachelor's degree.

13. Moderation and Registration of Assessors

Providers of programmes shall in the quality assurance process demonstrate that an effective moderation process exists to ensure that the assessment system is consistent and fair.

Registration of assessors is delegated by the Higher Education Quality Committee to the Higher Education providers responsible for programmes.

Appendix A: Method of Calculation of Credits and Allocation to Knowledge Area.

The method of calculation assumes that certain activities are scheduled on a regular weekly basis while others can only be quantified as a total activity over the duration of a course or module. This calculation makes the following assumptions:

1. Classroom or other scheduled contact activity generates notional hours of the student's own time for each hour of scheduled contact. The total is given by a multiplier applied to the contact time.
2. Two weeks of full-time activity accounts for assessment in a semester.
3. Assigned work generates only the notional hours judged to be necessary for completion of the work and is not multiplied.

Define for each course or module identified in the rules for the degree: Type of Activity, Time Unit in Hours and Contact Time Multiplier

The credit for the course is: C = {W (L*TL *ML + T*TT *MT) + P*TP *MP + X*TX *MX + A*TA }/10

Where:

L = number of lectures per week,
TL = duration of a lecture period
ML = total work per lecture period
T = number of tutorial per week
TT = duration of a tutorial period
MT = total work per tutorial period
P = total practical periods
T = duration of a practical period
MP = total work per practical period
X = total other contact periods
TX = duration of other period
MX = total work per other period
A = total assignment non-contact Hours
TA = 1 hour
W = number of weeks the course lasts (actual + 2 week per semester for examinations, if applicable to the course or module)

The resulting credit for a course or value may be divided between more than one knowledge area. In allocating the credit for a course to multiple knowledge areas, only new knowledge or skills in a particular area may be counted. Knowledge and skills developed in other courses and used in the course in question shall not be counted. Such knowledge is classified by the nature of the area in which it is applied. In summary, no knowledge is counted more than once as being new.

Appendix B: Consistency of Exit Level Outcomes with Critical Cross-field Outcomes (Normative)

SAQA Critical Cross-Field Outcomes	Equivalent Exit Level Outcome
Identifying and solving problems in which responses display that responsible decisions using critical thinking have been made.	ELO 1, 2, 3, 5, 11
Working effectively with others as a member of a team, group, organisation and community.	ELO 8, 11
Organising and managing oneself and one's activities responsibly and effectively	ELO 8, 11
Collecting, analysing, organising and critically evaluating information.	ELO 1, 3, 5, 11
Communicating effectively using visual, mathematical and/or language skills	ELO 2, 6, 11
Using science and technology effectively and critically, showing responsibility toward the environment and health of others	ELO 2, 3, 4, 5, 7, 11
Demonstrating an understanding of the world as a set of related systems by recognising that problem context do not exist in isolation	ELO 1, 3, 11
Contributing to the full personal development of each learner and the social and economic development of society at large, by making it an underlying intention of the programme of learning to make an individual aware of: • reflecting on and exploring a variety of strategies to learn more effectively • participating as responsible citizens in the life of local, national and global communities • being culturally and aesthetically sensitive across a range of contexts • exploring education and career opportunities • developing entrepreneurial opportunities	ELO 9 ELO 10 ELO 7 ELO 8 ELO 3

Appendix C: Exemplified Associated Assessment Criteria

The assessment criteria presented here are typifying, not normative.

Exit Level Outcome 1:

1.1 The problem is defined and the criterion for an acceptable solution is identified.
1.2 Relevant information and engineering knowledge and skills are identified for solving the problem.
1.3 Various approaches are considered and formulated that would lead to workable solutions.
1.4 Solutions are identified in terms of strengths and weaknesses for the overall solution.
1.5 Solutions are prioritised in order of suitability.
1.6 The preferred solution is formulated and presented in an appropriate form.

Exit Level Outcome 2:

2.1 An appropriate mix of knowledge of mathematics, natural and engineering science at a fundamental level and in a specialised area is brought to bear on the solution of *narrowly-defined* engineering problems.
2.2 Applicable principles and laws are applied.
2.3 Appropriate engineering materials, components or processes are selected.
2.4 Concepts and ideas are communicated effectively.
2.5 Reasoning about engineering materials, components, systems or processes is performed.
2.6 Work is performed within the boundaries of the practice area.

Exit Level Outcome 3:

3.1 The design problem is formulated to satisfy user needs, applicable standards, codes of practice and legislation.
3.2 The design process is planned and managed to focus on important issues and recognises and deals with constraints.
3.3 Knowledge, information and resources are acquired and evaluated in order to apply appropriate principles and design tools to provide a workable solution.
3.4 Design tasks are performed that include component testing to relevant premises, assumptions and constraints.
3.5 Alternatives are evaluated for implementation and a preferred solution is selected on an elementary, technical and cost basis.
3.6 The design logic and relevant information is communicated in a report.
3.7 Occupational health and safety and environmentally related risks are identified and appropriate measures considered

Exit Level Outcome 4:

4.1 Tests, experiments and measurements are conducted within an appropriate discipline.
4.2 Available literature is identified and selected for suitability to the task.
4.3 Equipment is used in accordance with original equipment manufacture's specifications.
4.4 Information is interpreted and derived from available data.
4.5 Conclusions are drawn from an evaluation of all available evidence.
4.6 The purpose, process and outcomes of the task are recorded in a report.
4.7 Occupational health and safety and environmentally related risks are identified and appropriate measures taken.

Exit Level Outcome 5:

5.1 The appropriate method, skill or tool is selected and applied to achieve the required result.
5.2 Results produced by the method, skill or tool are verified against requirements.
5.3 Computer applications are selected and used as required.
5.4 Refer to ECSA website to access the applicable discipline specific criteria, e.g.

Lift Inspectors	SCDS 01
Lifting Machinery Inspectors	SCDS 02
Medical Equipment Maintainers	SCDS 03
Fire Protection System Inspectors	SCDS 04
Any future Specified Category prescribed by the Council	SCDS 0n

Exit Level Outcome 6:

6.1 The structure, style and language of written and oral communication are appropriate for the purpose of the communication and the target audience.
6.2 Graphics used are appropriate and effective in enhancing the meaning of text.
6.3 Visual materials used enhance oral communications.
6.4 Information is provided in a format that can be used by others involved in the engineering activity.
6.5 Oral communication is delivered with the intended meaning being apparent.

Exit Level Outcome 7:

7.1 The engineering activity is considered in terms of the impact on the public health and safety.
7.2 The engineering activity is considered in terms of the impact on the occupational health and safety.
7.3 The engineering activity is considered in terms of the impact on the natural environment.

Exit Level Outcome 8:

8.1 The principles of planning, organising, leading and controlling are explained.
8.2 Individual work is carried out effectively and on time.
8.3 Individual contributions made to team activities support the output of the team as a whole.

Exit Level Outcome 9:

9.1 Learning tasks are identified, planned and managed.
9.2 Independent learning is undertaken: knowledge acquired outside of formal instruction is comprehended and applied.
9.3 Awareness is displayed of the need to maintain continued competence through keeping abreast of up-to-date tools and techniques available in the workplace.

Exit Level Outcome 10:

10.1 The ethical implications of the impact of engineering decisions are known and understood.
10.2 Responsibility is accepted for consequences stemming from own actions or failure to act.
10.3 Decision making is limited to area of current competence.

Revision History

Version	Date	Revision Authorized by	Nature of revision
Draft 1	15 July 2013	Technology SGG Working Group	Added LMI exit level outcomes to use as a discussion document.
Draft 2	22 July 2013	SGG Specified Category	Revise document to a generic model as recommended at the meeting of 19 July 2013
Draft 3	12 September 2013	SGG Specified Categories	Input from JIC and CRC incorporated. Approved by SGG Specified Categories.
Draft 4	17 September 2013	ESGB	Revisions from ESGB members incorporated. Approved by ESGB.

ENGINEERING COUNCIL OF SOUTH AFRICA *Standards and Procedures System*			ECSA
Higher Certificate in Engineering for Specified Categories: **EXIT LEVEL OUTCOME 05: DISCIPLINE SPECIFIC CRITERIA** (FOR GENERIC EXIT LEVEL OUTCOMES 1 TO 4 AND 6 TO10, PLEASE REFER TO THE COMPLETE E-07-SC DOCUMENT)			
Status: ESGB Working Document.			
Document: E-07-SC (Addendum)	**Draft 3**	**17 September 2013**	

SCDS 01 LIFT INSPECTORS (SPECIFIC CRITERIA)

5.4.1 Communicate at work.

5.4.1.1 Oral communication is maintained and adapted as required to promote effective interaction in a work context.

5.4.1.2 Information is accessed from standing instructions, visual information and a range of other workplace texts and responses where required are appropriate to the context.

5.4.1.3 Written communication is clear and unambiguous and at an appropriate level for designated target audiences.

5.4.2 Use mathematics and statistics in real life situations.

5.4.2.1 Mathematical functions are used correctly to solve routine workplace problems and tasks.

5.4.2.2 Findings on life related problems are interrogated in terms of their cause and solution.

5.4.2.3 Mathematical techniques are effectively and accurately applied in real life situations.

5.4.3 Release entrapped passengers from immobile lift.

5.4.3.1 Entrapped passengers are safely released from an immobile lift.

5.4.3.2 Unsafe conditions are identified and corrective actions are taken.

5.4.3.3 Access to workplace is limited to involved personnel only.

5.4.4 Inspect and test lifts and escalators.

5.4.4.1 Inspections comply with manufacturers' standards and statutory requirements.

5.4.4.2 Understanding of the relevant OHS and SANS requirements is demonstrated.

5.4.4.3 Unsafe conditions are identified and corrective actions are taken.

5.4.4.4 Access to workplace is limited to involved personnel only.

5.4.4.5 Electrical circuits and control systems are tested in accordance with manufacturer standards.

5.4.4.6 Mechanical devices and control systems are tested in accordance with manufacturer standards.

5.4.5 Produce and maintain administrative reports.

5.4.5.1 Reports are generated, stored and retrieved.

5.4.5.2 Different paths are used for obtaining information for schedules.

5.4.5.3 Corrective action is implemented to improve quality of project work.

5.4.5.4 Reports are used in providing administrative and financial control of the business.

5.4.6. Manage projects.

5.4.6.1 Tasks are prioritised to meet project deadlines.

5.4.6.2 Analyses of work requirements are compared with relevant business plans and microenvironment.

5.4.6.3 Potential risks that may affect project performance are recognised and appropriate actions are taken.

5.4.6.4 Legislation that may impact on the work environment is identified and actions are taken to direct work activities to comply with the legislation.

5.4.6.5 Requirements are ordered and procured in advance of being required.

SCDS 02 LIFTING MACHINERY INSPECTORS (SPECIFIC CRITERIA)

5.4.1 Communicate in the workplace

5.4.1.1 Reports are generated from available data
5.4.1.2 Data is presented in accordance with the relevant needs of target audiences
5.4.1.3 Oral communication is suited to the work context.
5.4.1.4 Written communication is clear and unambiguous and at an appropriate level for designated target audiences.

5.4.2 Compile and maintain work schedules

5.4.2.1 Scheduling is described in terms of its purpose and process
5.4.2.2 Project activities are defined in terms of the required project outcomes
5.4.2.3 Project plans are compiled in terms of identified activities
5.4.2.4 Activities are sequenced in terms of workflow and timelines
5.4.2.5 Activities are reported on in accordance with workplace requirements
5.4.2.6 Paperwork is recorded and stored in accordance with workplace requirements
5.4.2.7 Work activities are completed in accordance with agreed timeframes and efficiency

5.4.3 Apply engineering skills to the workplace

5.4.3.1 Hydraulic and pneumatic flow characteristics are explained in terms of engineering principles
5.4.3.2 Measurement of flow is explained in terms of fluid principles
5.4.3.3 Ferrous and non-ferrous metals are explained in terms of their properties and uses
5.4.3.4 Ferrous and non-ferrous alloys are explained in terms of their properties and uses
5.4.3.5 Thermo plastics and thermosetting plastics are explained in terms of their properties and uses
5.4.3.6 Machining principles are explained in terms of functions and accuracy
5.4.3.7 Work functions are explained in terms of quality in engineering practice
5.4.3.8 Engineering risks are identified in terms of the potential impact for each risk on the project
5.4.3.9 Actions to improve work functions are identified and analysed in terms of available options
5.4.3.10 Recommendations are communicated to relevant personnel in accordance with workplace requirements

5.4.4 Comply with relevant legislation in the workplace

5.4.4.1 Legislation relevant to the work activities is identified and accessed in accordance with workplace requirements
5.4.4.2 Legislation is interpreted in terms of the applicability to required work activities
5.4.4.3 The implications of non-compliance with legislation is explained in terms of work processes and penalties
5.4.4.4 Compliance reports are generated in terms of work activities

5.4.5 Inspect lifting machinery and equipment

Range: Candidates will be assessed against lifting tackle and at least one of the following categories:

- Chain blocks and lever hoists
- Forklifts
- Mobile cranes
- Overhead and gantry cranes

- Tower cranes
- Ships cranes
- Wharf side cranes
- Reach stackers
- Straddle carriers
- Container cranes
- Aerial platforms
- Suspended access platforms
- Industrial lifting devices
- Under the hook non-fixed attachments
- Tail lifters
- Vehicle hoists
- Other specialisation categories

5.4.5.1 Inspection activities are planned in accordance with the inspection required and the workplace requirements

5.4.5.2 The purpose of conducting various tests is explained in terms of relevant legislation and user safety standards

5.4.5.3 Inspection and testing equipment selected is appropriate to the inspection required

5.4.5.4 Authorisation to conduct inspection activities is obtained in accordance with workplace procedures

5.4.5.5 The work area is prepared for the relevant inspection in accordance with inspection requirements

5.4.5.6 Defects and potentially hazardous conditions are identified and corrected in accordance with workplace requirements

5.4.5.7 Public access to the worksite is restricted in accordance with statutory requirements and worksite procedures

5.4.5.8 Machinery and equipment is inspected and tested in accordance with test schedules and relevant safety and manufacturers standards

5.4.5.9 Deviances from acceptable standards are identified and reported to the relevant stakeholder in accordance with statutory requirements and manufacturer specifications

5.4.5.10 The consequences of omitting any part of the inspection and testing schedule are explained in terms of potential risks and liability

5.4.5.11 The worksite is cleared, secured and restored to a safe and serviceable condition in accordance with statutory and worksite requirements

5.4.5.12 Work activities are completed within agreed timeframes. The importance of completing activities in these timeframes is explained in terms of customer service and work interruptions

SCDS 03 MEDICAL EQUIPMENT MAINTAINERS (SPECIFIC CRITERIA)

5.4.1 Apply problem solving skills to maintain medical equipment

5.4.1.1 Variances from medical equipment specifications are identified in a methodical manner that includes all areas of performance.

5.4.1.2 Causes of faults are identified and actions taken, to prevent similar problems in the future, and are appropriate to the symptoms.

5.4.1.3 The operation of machines is described in terms of the process of enhancing human performance.

5.4.1.4 Alternative solutions to problems are identified that provide similar results.

5.4.1.5 Solutions identified are efficient in terms of cost, time and reliability.

5.4.1.6 Logical procedures are followed to correct all identified variances.

5.4.1.7 Variances are corrected in accordance with recognised clinical engineering procedures or codes of practice or medical health quality procedures.

5.4.2 Maintain medical equipment

Range: Candidates will be assessed against at least one of the following categories:

- Mechanical equipment
- Electro-medical equipment
- Respiratory and anaesthesia equipment
- Medical imaging equipment
- Other relevant equipment (specify)

5.4.2.1 Application and operation of medical equipment is described in the clinical environment.

5.4.2.2 Policies for maintenance work are sourced and confirmed for applicability with relevant sources.

5.4.2.3 The work area is prepared for the relevant activities in accordance with workplace requirements.

5.4.2.4 Defects are identified from user reports and test procedures.

5.4.2.5 Tools and test equipment used are appropriate to the type of medical equipment.

5.4.2.6 Faults are identified through logical fault finding procedures.

5.4.2.7 Medical equipment is repaired, maintained and calibrated in accordance with manufacturer specifications and relevant policies.

5.4.2.8 Equipment performance and safety inspections are completed according to relevant check lists and specifications before returning equipment to use.

5.4.2.9 Accurate equipment history is captured and recorded for future reference for a time period relevant to equipment type maintained and legal policies.

5.4.3 Apply scientific and engineering skills to maintain medical equipment

5.4.3.1 Work functions required in maintaining medical equipment are explained in terms of quality in engineering practice.

5.4.3.2 Engineering risks are identified in terms of the potential impact for each risk on safety and performance of medical equipment.

5.4.3.3 Actions to improve work functions are identified and analysed in terms of available options.

5.4.3.4 Different types of materials used in medical equipment are explained in terms of their properties and potential uses.

5.4.3.5 Fabrication principles for fabrication of required components are explained in terms of functions and accuracy.

5.4.3.6 Electrical circuits are tested and repaired in accordance with manufacturer specifications.

5.4.3.7 Hydraulic and pneumatic flow characteristics are explained in terms of engineering principles related to the medical equipment to be maintained.

5.4.3.8 Measurements and related procedures are explained in engineering terms.

5.4.4 Communicate maintenance information for medical equipment

5.4.4.1 Maintenance reports are generated from relevant data in accordance with workplace procedures.

5.4.4.2 Information included in the report is in accordance with the relevant needs of target audiences.

5.4.4.3 Documents and recommendations are generated in accordance with workplace requirements.

5.4.4.4 Methods of communicating maintenance information are suited to the work context.

5.4.4.5 Communication is clear, unambiguous and at an appropriate level for designated target audiences.

5.4.5 Comply with relevant legislation in maintaining medical equipment

5.4.5.1 Medical equipment maintenance activities are planned in accordance with workplace legislative requirements.

5.4.5.2 Authorisation to conduct activities is obtained in accordance with workplace procedures.

5.4.5.3 Potentially hazardous conditions are identified and reported in accordance with workplace requirements.

5.4.5.4 Deviances from acceptable standards are identified and reported to the relevant stakeholder in accordance with statutory requirements and manufacturer specifications.

5.4.5.5 The consequences of omitting procedures are explained in terms of potential risks and liability.

5.4.5.6 Maintenance activities are completed within agreed timeframes. The importance of completing activities in these timeframes is explained in terms of customer service and work interruptions.

5.4.6 Comply with accepted work ethics and good practice when maintaining medical equipment

5.4.6.1 Professional conduct is explained in accordance with relevant acts, codes of conduct and practice as it relates to maintaining medical equipment.

5.4.6.2 Maintenance of medical equipment is conducted in accordance with relevant acts.

5.4.6.3 Recognised clinical engineering principles are adhered to in order to preserve patient and public safety.
Range: Clinical engineering principles include all aspects of making equipment safe for the operator and patient.

5.4.6.4 Maintenance tasks are conducted economically and safely.

SCDS 04 FIRE PROTECTION SYSTEMS INSPECTORS (SPECIFIC CRITERIA)

Range of Systems:

a) Fire alarm and detection
b) Passive fire protection
c) Aerosol fire extinguishing
d) Water sprinkler
e) Powder fire extinguishing
f) Foam fire extinguishing
g) Electrical smoke control
h) Mechanical smoke control
i) Mechanical fixed gaseous fire extinguishing, and
j) Electrical fixed gaseous fire extinguishing

5.4.1 Installation: Demonstrate knowledge of the components of the equipment to be installed

5.4.1.1 The basic chemistry of combustion is described in accordance with accepted fire industry standards

5.4.1.2 Components are identified and the purpose of each component is described in terms of its main uses and limitations in the system

5.4.1.3 Consequences of incorrect installation are explained in terms of the effect on the system

5.4.1.4 Different fire risk zones or occupancy classifications are described in accordance with the relevant SANS standards. (For smoke control systems only, the interconnections between smoke control and other fire protection measures are explained in relation to their importance).

5.4.1.5 Static electricity is described in terms of the risks involved and precautionary measures that may be taken. (Not applicable to smoke control systems).

5.4.2 Installation: Prepare to install components making up the installation

5.4.2.1 Building plans (for aerosol extinguishing, equipment only) and schematic diagrams are interpreted to identify location of components.

5.4.2.2 Tools, equipment and components required for the installation are identified and prepared for use in accordance with the given design

5.4.2.3 The installation task is confirmed with relevant authorities in accordance with workplace procedures

5.4.2.4 Permission to install the system is confirmed with relevant personnel in accordance with relevant safety legislation

5.4.3 Installation: Install the components making up the system

5.4.3.1 Components are installed in accordance with manufacturer specifications

5.4.3.2 Components are positioned in accordance with contract documentation

5.4.3.3 Cables are installed in accordance with the relevant SANS standard. For water sprinkler, powder, foam and fixed gaseous systems pipes are used in accordance with the relevant legislation.

5.4.3.4 Work is conducted in accordance with relevant health and safety legislation

5.4.3.5 Work is conducted in accordance with agreed time schedules

5.4.3.6 Tools and equipment are used in accordance with their design

5.4.3.7 Power supply circuit breakers are labelled in accordance with health and safety legislation (Not applicable to fixed gaseous fire extinguishers).

5.4.4 Installation: Test the system

5.4.4.1 Continuity of wiring and piping where applicable is/are checked in accordance with manufacturer specifications

5.4.4.2 Test equipment is used in accordance with its design
5.4.4.3 Work is conducted in accordance with relevant health and safety legislation
5.4.4.4 Relevant documentation is completed in accordance with legislative requirements

5.4.5 Commissioning: Demonstrate knowledge of commissioning of systems
5.4.5.1 The purpose of commissioning the system is explained in terms of meeting client acceptance criteria
5.4.5.2 Limitations to commissioning are described in accordance with relevant health and safety legislation
5.4.5.3 Test methods are described in accordance with the relevant legislation/standard (Not applicable to smoke control systems).
5.4.5.4 Cross-zoning of detection zones is described in relation to the effect on the particular extinguishing systems. (Not applicable to passive, water sprinkler, and mechanical fixed gaseous fire protection systems).
5.4.5.5 The link between detection (or extinguishing) and ancillary (or protection) systems is explained in relation to design criteria. (Not applicable to mechanical gaseous systems).
5.4.5.6 Consequences of non-compliance of the system are explained in terms of the potential impact to safety and loss control

5.4.6 Commissioning: Activate and test systems
5.4.6.1 The system is initialised and checked for operation in accordance with design criteria
5.4.6.2 Operation of ancillary devices are confirmed to be in accordance with design criteria
5.4.6.3 Faults are rectified in accordance with manufacturer specifications
5.4.6.4 Information for an addressable system is obtained from the client and entered into the control panel in accordance with manufacturer specifications
5.4.6.5 Test equipment is used in accordance with its design

5.4.7 Commissioning: Inspect systems
5.4.7.1 The installation is confirmed to be in accordance with the building plans
5.4.7.2 The installation is checked for conformance to the schematic drawings
5.4.7.3 The power (or water for sprinklers) supply is confirmed to be correct in accordance with design criteria. (Not applicable to mechanical gaseous).
5.4.7.4 The system is confirmed to meet engineering and safety requirements

5.4.8 Commissioning: Certify systems
5.4.8.1 The system is confirmed to be in accordance with the design
5.4.8.2 Relevant documentation is completed in accordance with legislative requirements
5.4.8.3 Documentation is distributed in accordance with legislative requirements
5.4.8.4 The end user is briefed on the operation of the system in accordance with system requirements and user responsibilities

5.4.9 Maintenance: Demonstrate knowledge of maintaining the system
5.4.9.1 Different types of power supply systems (or water sprinkler supply, or fixed gaseous) are identified and described in terms of their applicability to the system
5.4.9.2 Different systems (listed in Range of Systems above) are described in terms of their main functions and maintenance procedures
or
5.4.9.2a For smoke control systems, the interconnection between different systems is described in terms of their importance in fire protection

5.4.9.3 Maintenance tasks and relevant equipment are described in accordance with accepted industry standards
5.4.9.4 Maintenance intervals are identified in accordance with manufacturer specifications
5.4.9.5 Safety requirements are described as they relate to specific zones

5.4.10 Maintenance: Test the particular system
5.4.10.1 The functionality of components and ancillary devices are confirmed to be in accordance with design criteria
5.4.10.2 The power (water, in case of sprinklers) supply system is tested in accordance with manufacturer specifications. (Not applicable to mechanical fixed gaseous systems)
or
5.4.10.2a For smoke control systems, the pneumatic system is tested in accordance with accepted codes of practice
or
5.4.10.2b For smoke control systems, interconnection with other fire protection systems are tested in accordance with manufacturers specifications
5.4.10.3 Tests are conducted without causing damage to property or equipment
5.4.10.4 Work is conducted in accordance with legislative safety requirements
5.4.10.5 The system is confirmed to be operational in accordance with design criteria

5.4.11 Maintenance: Repair the particular system
5.4.11.1 Faults with the system are identified and repaired or reported in accordance with design criteria
5.4.11.2 Replacement components are identified in terms of applicability and availability
5.4.11.3 Components are replaced in accordance with manufacturer specifications
5.4.11.4 Recommendations are made in relation to additions and rectifications

5.4.12 Maintenance: Report on maintenance procedures
5.4.12.1 The system is confirmed to be in accordance with the design
5.4.12.2 Relevant documentation is completed in accordance with legislative requirements
5.4.12.3 Documentation is distributed in accordance with legislative requirements
5.4.12.4 The end user is briefed on the operation of the system in accordance with system requirements and user responsibilities

Revision History

Version	Date	Revision Authorized by	Nature of revision
Draft 1	22 July 2013	SGG Specified Category	Original draft.
Draft 2	12 September 2013	SGG Specified Categories	Input from JIC and CRC incorporated. Approved by SGG Specified Categories Committee.
Draft 3	17 September 2013	ESGB	Revisions from ESGB members incorporated. Approved by ESGB.

ENGINEERING COUNCIL OF SOUTH AFRICA *Standards and Procedures System*			ECSA
Competency Standard for Registration in a Specified Category			
Status: ESGB Working Document			
Document : R-02-SC	**Rev-1**	**17 September 2013**	

1. Purpose

1.1 This standard defines the competence required for registration in a Specified Category. Definitions of terms having particular meaning within this standard are given in text in Appendix A.

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 specified in the applicable Discipline Specific Guidelines.

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 context;
and one or more of:
(e) can be solved by □tandardized or prescribed ways;
(f) are encompassed by specific standards, codes and documented procedures; requires □uthorization 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:
(j) requires practical judgement in specific practice area in evaluating solutions, considering interfaces to other role-players;
(k) have consequences which are locally important but within a specified category (wider impact are dealt with by others).

3.1.2 Assessment Criteria: An analysis of ***specifically-defined*** engineering problems (tasks) typified by the following performances is expected:

3.1.2.1 Understand the activity as agreed to with the client.
3.1.2.2 Analyse and clarify information, drawings, codes, procedures, etc.

3.1.3 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 or develop (plan) solutions to ***specifically-defined*** engineering problems (tasks).

3.2.1 Assessment Criteria: 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:

3.2.1.1 Develop and analyse alternative approaches to do the task. Check impacts;
3.2.1.2 Select the best solution, seeking advice and approval from stakeholders on aspects of the proposal or plan that falls outside established practices or standards.

3.2.2 Range Statement: The solution conforms to specific established methods, techniques or procedures within the specifically-defined practice 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 Assessment Criteria: This outcome is normally demonstrated in the course of planning, investigation or operations.
3.3.1.1 The use of codified underpinning educational knowledge in practical ***specifically-defined*** engineering activities;
3.3.1.2 The understanding of knowledge utilised in ***specifically-defined*** procedures and techniques.

3.3.2 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. Codified knowledge in related areas: financial, statutory, safety, management.
(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.

3.4.1 Assessment Criteria: The display of personal and work process management abilities is expected:
3.4.1.1 Manage self, work priorities, processes and resources (bar chart);
3.4.1.2 Participate effectively in a team environment.

3.5 Outcome 5:

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

3.5.1 Assessment Criteria: Demonstrates effective communication:
3.5.1.1 Writing clear, concise, effective, technically correct reports.

3.5.1.2 Issuing clear instructions to subordinates and presenting point of view effectively.

3.5.2 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
(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 the communication functions reliably and repeatedly.

Group C: Impacts of Engineering Activity.

3.6 Outcome 6:

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

3.6.1 Assessment Criteria: This outcome is normally displayed in the course of evaluating and planning tasks, by typically:

3.6.1.1 Identifying affected parties and environmental impacts of the engineering activity;
3.6.1.2 Proposing mitigating measures and communicate on measures to stakeholders.

3.7 Outcome 7:

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

3.7.1 Assessment Criteria:

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

3.7.2 Range Statement: 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 Assessment Criteria: Sensitivity to ethical issues and the adoption of a systematic approach to resolving these issues is expected, typified by:

3.8.1.1 Awareness of ethical problems and affected parties and their interests;
3.8.1.2 Compliance with ECSA's Code of Conduct.

3.8.2 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

3.9.1 Assessment Criteria: Exhibition of judgement is expected by:

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

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;
(b) consequences in the immediate work contexts;
(c) identifying a set of interested and affected parties with defined needs to be taken into account.

3.10 Outcome 10:

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

3.10.1 Assessment Criteria: Responsibility is displayed by the following performance:

3.10.1.1 Demonstrating a professional approach at all times by applying knowledge to justify actions;
3.10.1.2 Taking advice from a responsible authority on any matter considered to be outside applicable standards and codes;
3.10.1.3 Evaluating work output, revising as required and taking responsibility[1] for this work output.

3.10.2 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: Initial Professional Development (IPD)

3.11 Outcome 11:

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

3.11.1 Assessment Criteria: Self-development is managed by typically:

3.11.1.1 Planning own profession development strategy selecting appropriate development activities;

3.11.1.2 Keeping record of profession development displaying independent learning ability.

3.11.2 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: Definitions

'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.

"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.

"Outcome" at the *professional* level means a statement of the performance that a person must demonstrate in order to be judged competent.

"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.

"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.

"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 related to an identified need to protect the public safety, health and interest of the environment, in relation to an engineering activity.

Revision History

Version	Date	Revision Authorized by	Nature of revision
Rev0 Concept A	28 July 2012	Technician Registration Committee	First Draft
Rev0 Concept B	23 July 2013	SGG Specified Categories	Revisions as per SGG meeting of 19 July 2013.
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