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**Sub Discipline-Specific Training Requirements for
Candidate Fire Protection System Practitioners**

R-05-FPSP-SC

REVISION: 2: 11 September 2018



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DEFINITIONS

Alternative Route: See section 7.3 of document R-01-SC

Benchmark Route: See section 7.3 of document R-01-SC

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

Engineering science: 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, to solve problems and to provide the knowledge base for engineering specialisations

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

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

Integrated performance: 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, the checking of regulatory conformance and judgement in decisions


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

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

- direct and control all that is constructed or results from construction or manufacturing operations;
- operate engineering works safely and in the manner intended;
- return engineering works, plant and equipment to an acceptable condition by the renewal, replacement or mending of worn, damaged or decayed parts;

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- direct and control engineering processes and systems in addition to the commissioning, operation and decommissioning of equipment; and
- maintain equipment or engineering works in a state in which it can perform its required function.

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

Outcome (at the specified category level): A statement of the performance that a person must demonstrate in order to be judged competent

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


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

Specified Category: A category of registration for persons who must be registered through the Engineering Profession Act or a combination of the Engineering Profession Act and external legislation; a category of registration having specific engineering competencies that are normally at NQF Level 5 and are related to an identified need to protect the safety, health and interest of the public or the environment in relation to an engineering activity

Sustainable development: Development that meets the needs of the present without compromising the ability of future generations to meet their own needs

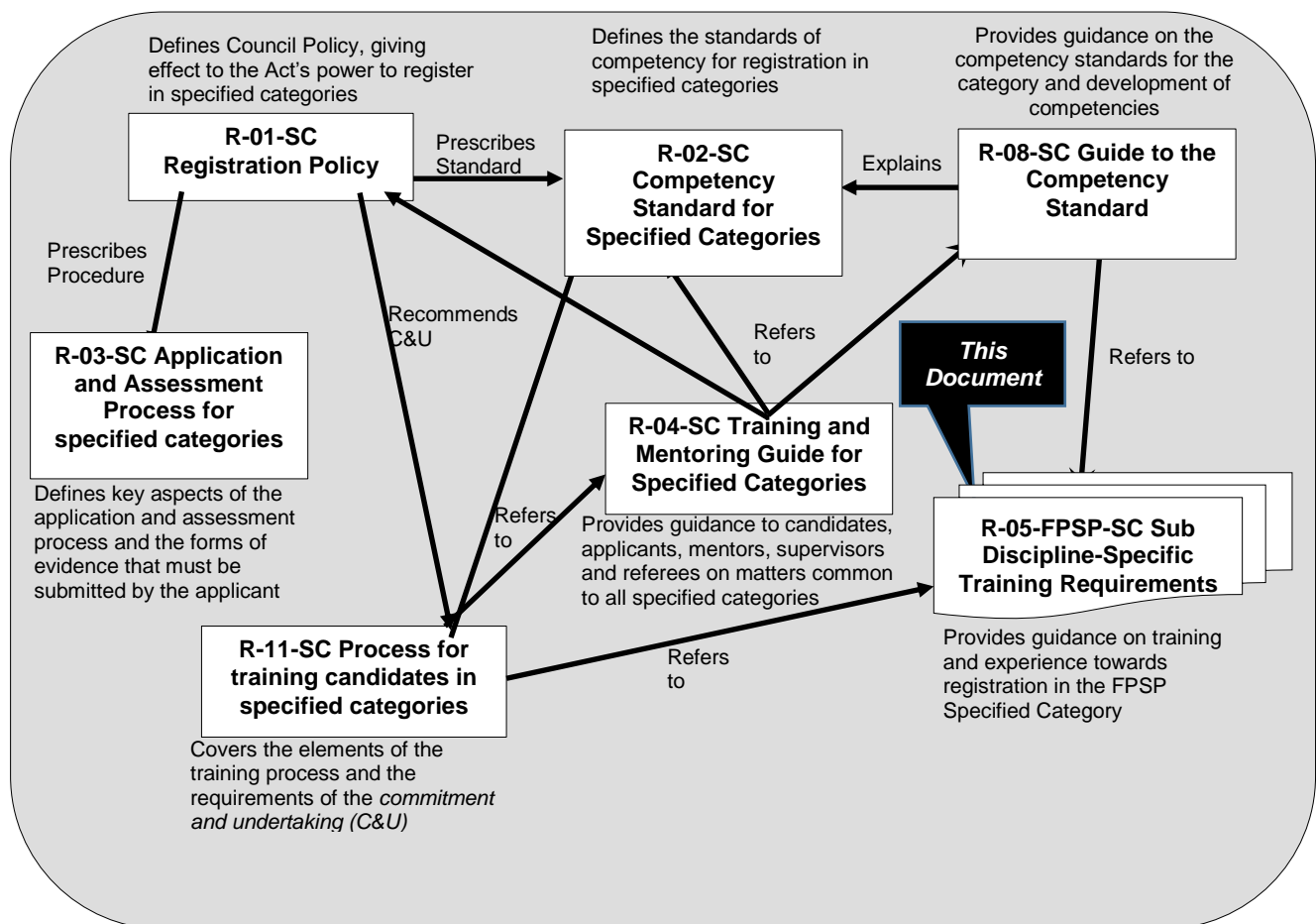
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BACKGROUND: ECSA REGISTRATION SYSTEM DOCUMENTS

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




ECSA registration system documents for specified categories

1. PURPOSE

All persons applying for registration in the Specified Category of Fire Protection System Practitioner (FPSP) are expected to demonstrate the competencies specified in document **R-02-**

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SC at the prescribed level through work performed by the applicant at the prescribed level of responsibility, irrespective of the type of Fire Protection System that is applied. In addition, the Sub discipline-Specific Requirements set out in Section 9.6 below must be met.

This document supplements the generic *Training and Mentoring Guide* (document **R-04-SC**), the *Guide to the Competency Standards for Registered Specified Category Practitioners* (document **R-08-SC**) and *Process for Training Engineering Candidates towards Specified Category Registration* (document **R-11-SC**).

In document **R-04-SC**, attention is drawn to the following:

- Duration of training and period working at level required for registration
- Principles of planning, training and experience
- Progression of training programme
- Documenting training and experience
- Demonstrating responsibility

Document **R-08-SC** provides a high-level and an outcome-by-outcome understanding of the competency standards as an essential basis for this Sub Discipline-Specific Training Requirements (SDSTRs) document.

The document **R-11-SC** elaborates on the elements of the training process and the requirements of the Commitment and Undertaking (C&U).

These Requirements and the documents **R-04-SC**, **R-08-SC** and **R-11-SC** are subordinate to the Policy on Registration (document **R-01-SC**), the Competency Standard (document **R-02-SC**) and the application process definition (document **R-03-SC**).


2. AUDIENCE

Firstly, the Requirements are directed at candidates and their supervisors and mentors in the sub discipline of Fire Protection System Practitioner. The Requirements are intended to support a programme of training and experience that incorporates good practice elements.

Secondly, the Requirements are directed at the members of the engineering team listed in Table

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1. Table 1 demonstrates the different categories for the engineering team of registered practitioners who accept full responsibility for their area of work and adhere to the ECSA Code of Conduct.

Table 1: Categories of registered practitioners comprising the engineering team

Category	Authority	Underpinning Knowledge	Area of Responsibility
Professional Engineer [EPA Section 18(1)(a)(i)]	Educated, trained and experienced to carry out complexly defined engineering work	Graduate attributes acquired in education at NQF level 8 (560 credits)	Complex interaction between professions and disciplines; Justify work outside codes, standards and procedures
Professional Certificated Engineer [EPA Section 18(1)(a)(iii)]	Educated, trained and experienced to carry out broadly defined engineering work	Graduate attributes acquired in education at NQF level 7 (420 credits) and Government Certificate of Competency	Interaction with other professions and disciplines; Authorisation required to work outside codes, standards and procedures after conducting research and investigation; Legal responsibility (OHS Act)
Professional Engineering Technologist [EPA Section 18(1)(a)(ii)]	Educated, trained and experienced to carry out broadly defined engineering work	Graduate attributes acquired in education at NQF level 7 (420 credits)	Interaction with other professions and disciplines; Authorisation required to work outside codes, standards and procedures after conducting research and investigation
Professional Engineering Technician [EPA Section 18(1)(a)(iv)]	Educated, trained and experienced to carry out well-defined engineering work	Graduate attributes acquired in education at NQF level 6 (280 to 360 credits)	Mainly working within a single discipline; Strict adherence to codes, standards and procedures;

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Category	Authority	Underpinning Knowledge	Area of Responsibility
			Repetitive work
Specified Category Practitioner [EPA Section 18(1)(c)]	Educated, trained and experienced to carry out specifically defined engineering work	Graduate attributes acquired in education at NQF level 5 (140 credits)	Working within a single discipline in a specific field; May be legally responsible for work

EPA = Engineering Professions Act (No. 46 of 2000); OHS = Occupational Health and Safety Act (No. 85 of 1993)

These Requirements apply to persons who have

- completed the educational requirements through the Benchmark or Engineering Management pathways presented in Table 2 below;
- met the educational requirements via the Alternative Route pathway presented in Table 2 (the evaluation/assessment as detailed in document **E-17-SC**). If the applicant does not have at least the benchmark academic qualification (HCert or equivalent or a Completed Apprenticeship), the application will be considered through the alternate route. The difference must be compensated by extended periods of engineering experience. The exact periods will depend upon the level of qualification held by the applicant. The work that the candidates are doing or have done as well as the submission of correctly completed Training and Experience Reports (TERs) (Forms TER/TEO-SC), the Engineering Report (Form ER-SC) and the Initial Professional Development Report (Form IPD-SC) must incorporate developmental evidence of meeting the educational requirements;
- registered as a Candidate in a Specified Category; and
- embarked on a process of acceptable training under a registered C&U with a mentor guiding the professional development process at each stage.

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Table 2: Minimum duration of education, training and experience for various pathways towards registration

Pathway	Qualification	Post qualification, total training and experience in the specific discipline	Post qualification experience (part of total) with responsibility as indicated
Experience Route (Alternative Route)	No tertiary qualification	NQF level 1: Twenty years NQF level 2: Fifteen years NQF level 3: Ten years NQF level 4: Five years	Two years' experience in testing and inspection or commissioning
Benchmark Route	Higher Certificate in Engineering or Equivalent (NQF 5) or Completed Apprenticeship in an Acceptable Trade (up to four years)	NQF level 5: Three years	Two years' experience in inspection, testing, commissioning, handover, certification, etc.
Engineering Management Type Route	BSc (Eng), BEng, BTech, N Dip, Advanced Certificate or Equivalent but not eligible for ECSA registration in any of the Professional Categories	NQF level 6: Three years NQF level 7: Three years NQF level 8: Three years	Two years' experience in planning, organising, leading, implementing and controlling engineering activities (including design control and approval; budget compilation and control; quality;

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Pathway	Qualification	Post qualification, total training and experience in the specific discipline	Post qualification experience (part of total) with responsibility as indicated
			environmental, safety and society management; legal matters; skills development; report and instruction writing; meeting management; ethics)


Notes:	<p>a. Training and experience must incorporate the legal requirements stipulated in the applicable laws, regulations and standards (as detailed in the SDSTRs R-05-nnn-SC).</p> <p>b. Training and experience must incorporate practical requirements detailed by equipment manufacturers, codes of practice, etc. applicable to the specific field (as detailed in the SDSTRs R-05-nnn-SC).</p> <p>c. Academic programmes referred to above must be accredited, recognised or evaluated as equivalent, with individual assessment if required.</p> <p>d. Equivalent refers to Equivalent Qualifications to the qualification(s) listed (e.g. past and future qualifications developed by education providers (QCTO, TVET) and accredited or recognised by the ECSA).</p>
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3. PERSONS NOT REGISTERED AS A CANDIDATE OR NOT TRAINING UNDER A C&U

All applicants for registration must present the same evidence of competence and be assessed against the same standards and requirements, irrespective of the development path followed. Application for registration as a Specified Category Practitioner is permitted without being registered as a Specified Category Candidate and without training under a C&U. Mentorship and

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adequate supervision is, however, a key factor in effective development to the level required for registration. A C&U indicates that the company is committed to mentorship and supervision.

If the trainee's employer does not offer C&U, the trainee should establish the level of mentorship and supervision that the employer is able to provide. In the absence of an internal mentor, the services of an external mentor should be secured. The recognised Voluntary Association for the sub discipline should be consulted for assistance in locating an external mentor. A mentor should be in place at all stages of the development process.

These Requirements are written for the recent graduate who is training and gaining experience towards registration. Mature applicants for registration may apply the Requirements retrospectively to identify possible gaps in their development.

Applicants who have not enjoyed mentorship are advised to request an experienced mentor (internal or external) to act as an application adviser while they prepare their application for registration.

These Requirements may be applied in the case of a person moving into a candidacy programme at a later stage that is at a level below that required for registration (see **Section 9.5**).


4. TRAINING OBJECTIVES

To achieve ECSA registration, the trainee's employer should design the training programme to achieve the following:

- Expose the applicant to experience and training, enabling the application of engineering theory acquired during educational development to practical workplace situations for the prescribed period
- Incorporate an increasing level of responsibility to enable the applicant to submit evidence in the TERs of achieving the duration and level detailed in **Section 9.1**
- Develop the engineering competency of the applicant to cover the eleven outcomes in the five major groups referred to in **Section 8.2 and Annexure B**, and the discipline-specific requirements referred to **Section 9.6**.

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5. FIRE PROTECTION SYSTEMS


The Engineering of Fire Protection Systems can be described as the application of rules (codes) and scientific and engineering principles. Fire protection systems require expert judgement based on an understanding of the phenomena and effects of fire, the interaction of the equipment provided the reaction and behaviour of people and the evaluation and assessment of property and the environment in regard to the destructive effects of fire.

The following engineering activities are undertaken daily by FPSPs and require expert levels of understanding. Individuals need to provide evidence of competence and must be assessed in these fields in order to prove that they can apply the correct level of expertise and that they understand the risks involved. These include the following:

- the design, production, checking, interpretation, evaluation and approval of fire plans, including specific fire protection system design;
- the inspection of building work regarding compliance of the specific fire protection system design in relation to public buildings, buildings of public entertainment, stadiums, tunnels and other structures in terms of safety in Building Control, the National Building Regulations and Building Standards Act (No.103 of 1977) and the National Building Regulations;
- the implementation of acceptable fire protection system engineering standards regarding fixed fire installations;
- the design of hydraulically calculated pipe work for sprinkler or water protection systems together with the required water supply tanks, low electrical current circuitry for fire protection systems, inert gas flow calculations, airflow calculations to prevent over pressure, and smoke-control design and calculations for safe evacuation of the public and/or workers;
- the assessment of the suitability and safety of equipment for high- and low-pressure installations of liquid petroleum gasses, flammable liquids and flammable or dangerous gasses in addition to the required or installed fire protection systems, including the cable types and equipment for electrical systems in explosive and flammable-liquid or flammable-vapour areas;
- the evaluation and testing of installation work and procedures for many and varied fire

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engineering and fire protection systems; and

- the inspection, approval, commissioning, signing off and subsequent maintenance of installed and different fire systems to ensure that they interface seamlessly to provide the correct level of life safety and protection.

Fire Protection System Practitioners are required to


- understand the nature and characteristics of fire, the mechanisms of the spread of fire and the control of fire;
- understand the chemical reactions and the latent effects and defects due to the combination of building materials and substances at excessively high temperatures;
- understand how fires originate and spread within and outside structures and how fires can be detected, controlled and extinguished;
- anticipate the behaviour of materials, structures, property and the environment when exposed to fire;
- understand the interactions and integration of fire safety systems and similar facilities; and
- make use of all the above and other required knowledge to understand the practice of fire protection systems.

The Engineering of fire protection systems, therefore, relies on various engineering disciplines to achieve the final aim. It is common practice for these disciplines to be managed by professional persons who have no formal education, training or experience in the field of Engineering of fire protection systems. Most of these persons are performing work prescribed by the National Building Regulations, the Occupational Health and Safety Act (OHS Act), SANS Standards or Code of Practices or other Acts that regulate safety under the Flammable Substances Regulations.

The majority of these persons are not subject to a controlling authority regarding professionalism, and their competency may be suspect. The work conducted by such persons influences the health and safety of persons inside buildings (occupants and clients), workers involved with the building or structures in question and the community at large. Buildings are becoming larger and more complex with less compartmentalisation. The result is that more people are being placed at

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risk of fire. There is little technical guidance that uses time-based calculations to address the important relationship between the time required for escape and the time available for escape or the interaction of equipment such as sprinkler systems, detection and ventilation.

Competent FPSPs registered by the ECSA assist in further education, development and training to ensure competency and the acceptance of work responsibility. Participating in the candidacy scheme of the ECSA with the associated C&U, adhering to the ECSA's Continuing Professional Development (CPD) requirements and complying with the ECSA Code of Conduct improves the service to the public and promotes the standing of these practitioners.

The National Building Regulations defines a *competent person* as indicated below:

[A] person who is qualified by virtue of his education, training, experience and contextual knowledge to make a determination regarding the performance of a building or part thereof in relation to a functional regulation or to undertake such duties as may be assigned to him in terms of these regulations.


The South African National Standard, SANS 10400, defines a competent person further so that a building control officer or an owner may readily identify who is competent to perform the various duties that need to be undertaken in order to implement the National Building Regulations effectively.

A *competent person* who is not necessarily a Professional Engineer or a Professional Engineering Technologist is required in terms of SANS 10400

- to design, install or maintain a fixed automatic fire-fighting system that is designed in accordance with SANS 306-4 (Fire extinguishing installations and equipment on premises – Part 4: Specification for carbon dioxide systems), SANS 14520-1/ISO 14520-1 (Gaseous fire-extinguishing systems – Physical properties and system design – Part 1: General requirements) and SANS 10287 (Automatic sprinkler installations for fire-fighting purposes);
- to install, maintain and service fire extinguishers in accordance with SANS 1475-1 (The production of reconditioned fire-fighting equipment – Part 1: Portable and wheeled (mobile) rechargeable fire extinguishers) and SANS 10105-1 (The use and control of fire-

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fighting equipment – Part 1: Portable and wheeled (mobile) fire extinguishers);

- to supervise the installation and construction of liquid fuel tanks and associated equipment in accordance with SANS 10089-3 (The petroleum industry – Part 3: The installation of underground storage tanks, pumps/dispensers and pipework at service stations and consumer installations) and SANS 10131 (Above-ground storage tanks for petroleum products);
- to design, install, test and maintain pressurised emergency routes in accordance with EN 12101-6 (Smoke and heat control systems – Part 6: Specification for pressure differential systems – Kits); and
- to design, install and maintain fire detection systems and alarm systems in accordance with SANS 10139 (Fire detection and alarm systems for buildings – System design, installation and servicing).


Structured training of *competent* FPSPs that results in ECSA registration provides a means of certifying the basic competencies of those engaged in aspects of fire engineering in a manner that owners of buildings and building control officers can readily establish the credentials of such persons and thus identify who is competent to perform specific tasks. Through registration, the fire and safety outcomes of the National Building Regulations would also be improved since they are reliant on people having the necessary skills and experience to make judgements in applying the relevant national fire safety standards.

Fire protection systems consist of Fire Detection, Alarm and Detection, Fixed Gaseous Systems and Water-Based Systems (See Appendix A).

The identified regulatory requirements and the developed fire safety strategy that is agreed upon with the enforcement authorities has to be translated into physical fire protection by designing and specifying the products and systems and including correct installation, commissioning and maintenance. A number of parties may have reasonable claim to influence the specification. These include the building owner, occupier, architect, insurers, fire safety engineer, main contractor and fire protection contractor. The number of interested parties can give rise to problems, not least being because they are rarely involved at the same time. Consequently, a specification drawn up by the architect implementing the fire safety strategy may subsequently be

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changed by others. This is a necessary part of the process, but there is potential for specifications to be inadequate or for the requirements of the original fire safety strategy to be compromised.

It follows that the design, manufacture, use, maintenance, inspection and testing of fire protection systems must be in accordance with accepted and prescribed regulations and standards. Audits at fixed intervals to verify this must be undertaken. The required well-administered record of work performed and inspections undertaken must be recorded, and inspections must be carried out timeously to avoid incidents that endanger the workforce and the public.

The ECSA Registered FPSPs are each allocated a registration number after assessment with a portfolio of evidence on file and a letter detailing their competency in Design, Installation, Commissioning, Maintenance and/or Inspection of the specific fire protection systems on which their registration permits them to work. All stakeholders, including manufacturers, equipment suppliers and maintainers, building owners and building inspectors agree that the registration of FPSPs after evaluation who are consequently ethically bound will be of tremendous advantage to the industry.


6. TRAINING IMPLICATIONS OF THE NATURE AND ORGANISATION OF THE INDUSTRY

Fire Protection System Practitioners may be employed in both the private and the public sectors. In the private sector, the FPSPs would typically be involved in contracting, supply companies or manufacturing/installation organisations. Engineering contractors are responsible for project implementation and their activities include planning, construction, labour and resource management. Those working in supply or manufacturing companies could be involved in research and development and as such would be involved in production, supply and quality control.

The public sector is responsible for service delivery and is usually the client, although in some departments, construction is also performed. Fire Protection System Practitioners are required at all levels of the public sector, including national, provincial and local government levels, state-owned enterprises and public utilities. In the public sector, FPSPs mainly oversee implementation, operations and maintenance of infrastructure. Extensions of the public sector

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include tertiary academic institutions and research organisations.

Applicable fire protection system

Depending on the requirements for fire protection and the design, installation, commissioning and/or maintenance, Candidate FPSPs will select one or more fire protection systems for the purpose of registration as a knowledge area for the Candidate FPSP through the full career path of the Registered FPSP. The present systems identified by the ECSA are listed and described in **Appendix A** with the applicable SANS or other standard given if available.

Ability to provide complete training

Depending on where the candidate is employed, there may be situations in which the in-house opportunities are not sufficiently diverse to develop all the competencies required in all the groups noted in document **R-02-SC** and in **Appendix B**. For example, both the opportunity for developing problem-solving competence (including design and the development of solutions) and the opportunity for managing engineering activities (including implementation and construction of solutions) may not be available to the candidate. In such cases, employers are encouraged to appoint an external mentor.


It is a fairly common practice that if an organisation is not able to provide training in certain areas, secondments are arranged with other organisations so that the candidate is able to develop all the competencies required for registration. These secondments are usually of a reciprocal nature so that both employers and their respective employees mutually benefit. Secondments between consultants and contractors and between the public and private sectors are also possible.

Problem-solving is the core of engineering. It is a logical thinking process that requires FPSPs to apply their minds diligently to bring solutions to specific technically defined problems. This process involves the analysis of fire protection systems, the assembly of mechanical, electrical and building components and the integration of the various engineering elements applicable to fire protection systems through the application of basic and engineering sciences.

The problem-solving experience may be obtained in any of the work categories presented below.

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6.1 Design or development

Examples of acceptable design or development include the following:

- Modifications after obtaining approval for specifically defined fluid systems on fire protection systems
- Modifications after obtaining approval for the specifically defined minor parts of the mechanical and electrical components of fire protection systems
- Modifications after obtaining approval for the commissioning, testing and inspection procedures relating to fire protection systems
- Modifications after obtaining approval for specifically defined structures of fire protection systems


6.2 Operations

Operations mainly deal with investigating failure or underperformance of fire protection systems and the synthesis and implementation of proven solutions to avoid reoccurrence of the problem. In addition, this category of work involves the practical improvement that is recommended for optimising the operational efficiencies. In performing the abovementioned work, FPSPs must apply engineering judgement to all work done in the management of operations. This includes the ability to assess design work against the following criteria:

- Conformance to design specifications and health and safety regulations
- Ease of fabrication and assembly
- Constructability
- Maintainability
- Conformance to environmental requirements
- Ergonomic considerations
- Life-cycle costs
- Alternative solutions

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6.3 Research and development

This type of work may be performed in research and product development centres of business organisations or in academic institutions. Candidate FPSPs must participate in research and development work that is predominantly of a mechanical/electrical engineering nature. This work must include the application of the various aspects of mechanical/electrical engineering, including product or system testing under controlled experimental conditions.

7. DEVELOPING COMPETENCY: ELABORATING ON SECTIONS IN THE GUIDE TO THE COMPETENCY STANDARD (R-08-SC)

Applicants are required to demonstrate the insight and the ability to use and interface various aspects through verifiable performance in providing engineered solutions to practical, specifically defined problems experienced in their operating work environment. In addition, applicants must develop the skills required to demonstrate the use of applicable engineering knowledge in optimising the efficiency of operations.

Candidate FPSPs must be able to demonstrate that they have been actively involved in a mechanical and electrical workshop environment and participated in the execution of practical work to the extent that they have learnt sufficient details on basic mechanical and electrical procedures to be able to exercise judgement in the workplace thereafter.

What is a sufficiently specifically defined engineering problem?


The definition of *specifically defined* in regard to *specifically defined engineering problems* is summarised by the ECSA as follows:

Composed of ***inter-related conditions***; requiring ***underpinning methods, procedures and techniques judgment*** [sic] to create a solution within a set of ***specifically-defined conditions***.

The design or development is a logical thinking process that requires FPSPs to apply their minds carefully when bringing solutions to specifically defined problems. This process involves the analysis of systems or the assembly of mechanical and electrical components and the integration

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of various elements of engineering through the application of basic and engineering sciences. Simple, straightforward calculation exercises and graphical representations from computer-generated data are considered to be engineering designs or developments that are sufficiently specifically defined.

In demonstrating the application of theoretical knowledge, applicants must incorporate calculations with clearly defined inputs regarding the formulae used and detailed interpretation of the results obtained. Applicants must demonstrate how the calculated results were used to provide the solution to the problem at hand and indicate the economic benefit to the project or the operating work environment.

Candidate FPSPs must obtain experience in solving a variety of problems in their work environment. The solutions to these problems should also involve the use of the fundamental engineering knowledge that was obtained at a University of Technology or from an accredited academic engineering programme. The solutions to problems that require a scientific and engineering approach may be encountered in the requested work on fire protection systems. From their early training years, candidates must actively seek opportunities in the workplace to obtain experience in the area of synthesising solutions to the real-life engineering problems of fire protection systems.


A suitable period of time and degree of practical participation should be sought by Candidate FPSPs in the workshop environment, learning the basic practices that are the essence of the mechanical and electrical disciplines so that they are capable of judging the efficacies of such practices in the general workplace thereafter.

7.1 Contextual knowledge

Candidates are expected to be aware of the requirements of the engineering profession. The recognised Voluntary Association that is applicable to the FPSP and its functions and services to members provide a broad range of contextual knowledge for the Candidate FPSP that extends through the full career path of the Registered FPSP. The practice area of the FPSP identifies specific contextual activities that are considered an essential component of the development of competence in the FPSP. These activities include awareness of basic workshop manufacturing,

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fabrication and on-site activities and indicate the competencies required of the engineer, technologist, technician, FPSP and artisan. Practice exposure in these areas is identified in each programme within the employer environment.

The ECSA Registration Assessors, Reviewers and Moderators for Specified Categories on Fire Protection Systems Equipment perform the review of the portfolio of evidence of the Candidate FPSP at the completion of the training period.

7.2 Functions performed

Special considerations in the Fire Protection System group and each specific type of system or speciality must be given to the competencies specified in the following groups as described in the Degree of Responsibility Scale presented in Table 4 of document R-04-SC:

- Responsibility Level A: Knowledge-based problem-solving
- Responsibility Level B: Management and communication
- Responsibility Level C: Identifying and mitigating the impacts of the engineering activity
- Responsibility Level D: Judgement and responsibility
- Responsibility Level E: Independent learning


For the Sub Discipline-Specific Requirements for Fire Protection Systems refer to Section 8.6 below and Form R-05-SDSRR-FPSP.

The progression of the candidate's competency can be measured as indicated in Section 8.1 below.

Appendix B was developed to align the progression of the Candidate FPSP with the Degree of Responsibility Scale. It should be noted that the Candidate FPSP working at Responsibility Level E carries the responsibility for work performed that is appropriate to that of a registered person except that the supervisor of the Candidate FPSP is accountable for the candidate's recommendations and decisions.

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7.3 Industry-related statutory and other requirements

Candidates are expected to have a working knowledge of the following regulations, Acts and standards and how they affect their working environment:

- Occupation Health and Safety Act (No. 85 of 1993), as amended by Act No. 181 of 1993
- Environment Conservation Act (No. 73 of 1989), as amended by Act No. 52 of 1994 and Act No. 50 of 2003
- Labour Relations Act (No. 66 of 1995)
- Building Regulations – National Building Regulations and Building Standards Act (No. 103 of 1977), as amended by Act No. 49 of 1995
- Industry-specific work instructions, including manufacturer's instructions applicable to specific lifting equipment types
- SANS and other international standards such as ISO, EN, DIN or US Federal Standards.
(Also refer to **Appendix A**)

Many other Acts that are not listed here may also be pertinent to the work environment of the Candidate FPSP. The Candidate FPSP will be expected to have a basic knowledge of the applicable Acts and to investigate whether or not any Acts are applicable to the particular work environment.


7.4 Recommended formal learning activities

The following list of formal learning activities is a sample of useful course types:

- CPD courses on specific disciplines and equipment types
- Elementary Project Management
- Negotiation skills
- Risk analysis
- Quality Systems
- Occupational health and safety
- Maintenance Engineering
- Environmental impacts
- Report writing and communication

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- Planning methods

8. PROGRAMME STRUCTURE AND SEQUENCING

8.1 Best practice

There is no ideal training programme structure or unique sequencing that constitutes best practice. The training programme for each Candidate FPSP will depend on the work opportunities that are available at the time for the employer to assign to the candidate.


It is suggested that Candidate FPSPs work with their mentors to select appropriate equipment types to gain exposure to the eventual responsibility for design, installation, commissioning and/or maintenance of the fire protection system(s) selected.

The training programme should be such that the Candidate FPSP progresses through the levels of work capability described in document **R-04-SC** so that by the end of the training period, the Candidate FPSP can perform individually and as a team member, meeting the engineering outcomes and the discipline-specific requirements at the level required for registration and exhibiting a Degree of Responsibility Level E.

The nature of the work and the degree of responsibility defined in document **R-04-SC** are presented below and in **Appendix B**.

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A: Being Exposed	B: Assisting	C: Participating	D: Contributing	E: Performing
Undergoes induction; observes processes and work of competent practitioners	Performs specific processes under close supervision	Performs specific processes as directed with limited supervision	Performs specific work with detailed approval of work outputs	Works in team without supervision; recommends work outputs; responsible but not accountable
Responsible to supervisor	Limited responsibility for work output	Full responsibility for supervised work	Full responsibility to supervisor for immediate quality of work	Level of responsibility to supervisor is appropriate to a registered person; supervisor is accountable for applicant's decisions

The Mentor and the Candidate FPSP must identify the level of responsibility that an activity demonstrates to be compliant with the various outcomes. Evidence of the candidate's activities are recorded on the appropriate system such that it meets the requirements of the Training Elements (**Appendix B**). The ECSA specifies the applicable recording system in the Application for Registration form. This usually involves an Engineering Report and a Sub discipline-Specific Requirement Report with the associated calculations, sketches, installation schedules, maintenance schedules, commission results, etc. for each selection that is applied for.


8.2 Orientation requirements

The following are orientation requirements:

- Introduction to the company
- Company Safety Regulations
- Company Code of Conduct
- Company Staff Code and Regulations
- Company records and record-keeping

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- Typical functions and activities

8.3 Realities

Irrespective of the system type(s), it is generally unlikely that the period of training will be three years, which is the minimum time required by the ECSA. Typically, it will be longer and will be determined by the availability of functions in the actual work situation together with other factors.

Each candidate will effectively undertake a unique programme in which the various activities carried out at the discipline-specific level are linked to the generic competency requirements presented in document **R-08-SC** and to the **Compulsory Sub Discipline-Specific Requirements that are to be met during the candidacy**.

8.4 Considerations for generalists, specialists, researchers and academics

Section 10 of document **R-08-SC** adequately describes what is expected of persons whose formative development has not followed a conventional path, for example, academics, researchers and specialists and persons who have not followed a candidate training programme.

The overriding consideration is that irrespective of the route followed, the applicant must provide evidence of the competence stipulated in the **Standard** and the **Sub Discipline-Specific Requirements**.


8.5 Moving into or changing candidacy programmes

This guide assumes that the Candidate FPSP enters a programme after graduation and continues with the programme until ready to submit an application for registration. The guide also assumes that the Candidate FPSP is supervised and mentored by persons who meet the requirements stated in document **R-04-SC**. In the case of a person changing from one candidacy programme to another or moving into a candidacy programme from a less structured environment, it is essential that the following steps are completed:

- The Candidate FPSP must complete the Training and Experience Summary (TES) and the TERs for the previous programme or unstructured experience. In the latter case, it is

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important to reconstruct the experience as accurately as possible. The TERs must be signed off.

- On entering the new programme, the Mentor and Supervisor should review the development of the Candidate FPSP while considering past experience and opportunities and the requirements of the new programme.
- The next phase of the candidate's programme must be planned.
- The Candidate FPSP must complete the Sub Discipline-Specific Requirements Report (SDSRR) on elements already covered during the initial part of the candidacy.

8.6 Compulsory Sub Discipline-Specific Requirements to be met during the candidacy

There is a critical need in the industry to identify people who are able to conduct the essential operations associated with the efficient and safe design, installation, commissioning, maintenance and inspection of fire protection systems. An additional need exists to identify *competent persons in Fire Engineering* accomplishing *rational designs*. This will lead to competence in the field of work and thereby add value to the industry and improve the economy of the country. It will also lead to a balanced society in that learners will understand how the work they do fits into the greater engineering industry.


During candidacy, candidates assisted by Mentors and Supervisors must ensure that they are conversant with the practical knowledge set out in the forms listed below and submit evidence of this as part of the Application for Registration form.

Applications for a Specified Category Practitioner in fire protection system design, installation, commissioning, maintenance and inspection must submit the SDSRR form **SDSRR-FPSP-FG** for Fixed Gaseous Systems, the **SDSRR-FPSP-WBS** for Water-Based Systems and the **SDSRR-FPSP-FD** for Fire Detection Systems.

These forms are part of the required Application for Registration forms.

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REVISION HISTORY

Version	Date	Nature of Revision	Approved By
Concept A	19 April 2013	Initial attempt at LMI DSTG based on R-05-MEC-PN with own Appendices A and B added. Needs input from LMI Registration Committee and CRC Specified Category Sub-Committee	Erasmus/JIC
Concept B	5 June 2015	Providing for a higher level type of Specified Category called Engineering Management. Incorporating editing by Dr Stidworthy and Mr Van Niekerk.	CRC Working Group
Concept C	5 June 2015	Logical improvements recommended by the WG implemented. Concept of sub discipline added.	Working Group (WG) draft for submission to the CRC and SC committees
Concept D	29 July 2015	Amended and approved by WG	Working Group (WG) draft for submission to the CRC and SC committees
Rev. 1	5 Nov 2015		Approved by CRC
Rev.1 Draft A	1 March 2017	Initial attempt based on LMI version and incorporating information from previous and approved Fire Protection System Inspector records. New approaches included.	For consideration by Steering Committee
Rev. 1 Draft B	2 March 2017	Revisions to Section 8.2 to incorporate information from Mr Le Grange on aspects of Rational Design.	For consideration by Steering Committee
Rev. 1 Draft C	14 May 2018	Revisions C, D and E revised to revert back to the version with no reference to Rational Design, which will be discussed separately. Inspector role retained and improvements recommended by Mr Norgate incorporated. Sub discipline-specific Requirement Form R-05-SDSRR-FPSP removed and included in the application forms.	For consideration by Fire Protection Systems Workshop
Rev. 2	11 Sep 2018	Approval	PDSG Committee

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The Sub Discipline-Specific Training Requirements for:

Candidate Fire Protection System Practitioners

Revision 2 dated 11 September 2018 and consisting of 28 pages has been reviewed for adequacy by the Business Unit Manager and is approved by the Executive: Research, Policy and Standards (RPS).



 Business Unit Manager

..... 14/02/2019
 Date




 Executive: RPS

..... 15/02/2019
 Date

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

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APPENDICES

Appendix A: Specific fire protection system types for registration as a Fire Protection System Practitioner

No.	Description of Equipment Type	Applicable Standard
1.	Fire alarm and detection	SANS 10139: 2012 Fire detection and alarm systems for buildings – System design, installation and servicing SANS 50054: 2009 and EN 54: 1996 Fire detection and fire alarm systems
2.	Passive fire protection	BS 576 (parts 20–24) Resistance to fire: The ability of a product to prevent the spread of flame and/or smoke and where relevant, to maintain mechanical stability. Tests for resistance to fire to assess the ability of a product to perform in a particular manner when used in specific circumstances. BS 5950 Part 8 Fire safety engineered design solutions SANS 10400 Fire protection (Part T) and Fire installation (Part W).
3.	Aerosol fire extinguishing	SANS 15779 2012 and ISO 15779: 2011 Condensed aerosol fire extinguishing systems – Requirements and test methods for components and system design, installation and maintenance SANS 331 Fire extinguishing aerosol systems
4.	Water sprinkler	SABS 0287: 2000 Automatic sprinkler installations for fire-fighting purposes SANS 10287 Automatic sprinkler installations for fire-fighting purposes
5.	Powder fire extinguishing	SANS 7202: 2012 and ISO 7202: 2012 Fire protection – Fire extinguishing media – Powder
6.	Foam fire extinguishing	SANS 7203: 2013 and ISO 7203: 2011 Fire extinguishing media – Foam concentrates. NFPA 11 Standard for low, medium and high expansion foam
7.	Electrical smoke control	EN 54-20, Class A, B and C

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No.	Description of Equipment Type	Applicable Standard
		NFPA 72 National Fire Alarm and Signalling Code
8.	Mechanical smoke control	EN 54-20, Class A, B and C NFPA 72 National Fire Alarm and Signalling Code
9.	Mechanical fixed gaseous fire extinguishing	SANS 14520 and ISO 14520 Gaseous fire extinguishing systems SANS 369-2: 2004 Code of Practice: Mechanical actuation of gaseous total flooding and local application extinguishing systems SANS 306-4 Specification for carbon dioxide systems
10.	Electrical fixed gaseous fire extinguishing	SANS 14520 and ISO 14520 Gaseous fire extinguishing systems. SANS 369-1: 2004 Code of Practice: Electrical actuation of gaseous total flooding extinguishing systems SANS 306-4 Specification for carbon dioxide systems

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Appendix B: Training Elements


This guide is written for the recent graduate who is training and gaining experience towards registration (Benchmark Route). Mature applicants for registration (Alternative Route) may apply the guide retrospectively to identify possible gaps in their development.

Synopsis: Candidate Specified Category Practitioners should achieve specific competencies at the prescribed level during their development towards registration and at the same time, accept more and more responsibility as experience is gained. The outcomes achieved and established during the candidacy phase should form the template for all engineering work performed after registration, regardless of the level of responsibility at any particular stage of the engineering career:

1. Confirm understanding of instructions received and clarify if necessary
2. Use theoretical training to develop possible approaches to the work and thereafter, select the best and present to the recipient
3. Apply theoretical knowledge to justify decisions taken and processes used
4. Understand one's role in the work team and plan and schedule work accordingly
5. Issue complete and clear instructions and report comprehensively on work completed
6. Be sensitive about the impact of the engineering activity and take action to mitigate this impact
7. Consider and adhere to the legislation that is applicable to the task and the associated risk identification and management
8. Adhere strictly to high ethical behavioural standards and to the ECSA Code of Conduct
9. Display sound judgement when all evidence is not available by considering all factors and their interrelationship, consequences and evaluation

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10. Accept responsibility for own work by using theory to support decisions, seeking advice when uncertain and evaluating shortcomings
11. Become conversant with employer's training and development programme and develop own lifelong development programme within this framework


Specifically defined engineering work is usually restricted to applying standard procedures, codes and systems (i.e. work that **was done before within the narrow field of application**).

In the following table, the Responsibility Levels are indicated as: A = Being Exposed; B = Assisting; C = Participating; D = Contributing; E = Performing.

Competency Standards for Registration as a Specified Category Practitioner	Explanation and Responsibility Level
<p>1. PURPOSE</p> <p>This standard defines the competence required for registration as a Specified Category Practitioner. Definitions of terms having particular meaning within this standard are given at the end of this appendix and in document R-01-SC.</p>	<p>Discipline-Specific Training Guides (DSTGs) give context to the purpose of the Competency Standards. Registered Specified Category Practitioners operate within the nine disciplines recognised by the ECSA. Each discipline can be further divided into sub disciplines and finally into specific workplaces or competency areas. The <u>DSTGs are used to facilitate experiential development towards ECSA registration and to assist in compiling the required portfolio of evidence (specifically the Engineering Report in the application form)</u>.</p> <p>NOTE: The training period must be used to develop the competence of the trainee towards achieving the standards presented below at the responsibility level indicated (mostly Level E: Performing). Refer to Table 4 in document R-04-SC.</p>

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<p>2. DEMONSTRATION OF COMPETENCE</p> <p>Competence must be demonstrated within <i>specifically defined engineering activities</i> (defined below) by the integrated performance of the outcomes defined in Section 3 of this appendix at the level indicated for each outcome. Required contexts and functions are specified in the applicable Sub discipline-Specific Training Requirements.</p> <p>Level descriptor: <i>Specifically defined engineering activities</i> demonstrate several of the following characteristics:</p> <ul style="list-style-type: none"> • Scope of specific practice area is defined by specific applied techniques; change is by adopting new specific techniques into current practice. • Practice area is located within a wider, complex <i>context</i>, with specifically defined working relationships with other parties and disciplines. • Work involves specific and familiar <i>resources</i>, including people, money, equipment, materials and technologies. • Activities require resolution of <i>interactions</i> manifested between specific technical factors with limited impact on wider issues. 	<p>Engineering activities can be approximately divided into</p> <ul style="list-style-type: none"> 5% Complex (Professional Engineers) 5% Broadly defined (Professional Engineering Technologists) 10% Well-defined (Professional Engineering Technicians) 15% Specifically defined (Registered Specified Categories) 20% Skilled workman (Engineering Artisan) 45% Unskilled workman (Artisan Assistants) <p>The activities can be in-house or contracted out; evidence of integrated performance should be submitted irrespective of the situation.</p> <p>Level descriptor: <i>Specifically defined engineering activities</i> in the specific discipline is characterised by several or all of the following:</p> <ul style="list-style-type: none"> • <i>Scope</i> of practice area does not cover the entire field of the specific discipline (exposure limited to the relevant components of the specific sub discipline and specific workplace). Techniques applied are largely well established, and change by adopting new specific techniques into current practice is the exception. • Practice area varies substantially with unlimited location possibilities and the additional responsibility of identifying the need for <i>complex, broadly defined and/or well-defined</i> advice is included in the specifically defined working relationships with other parties and disciplines. • The bulk of the work involves a familiar and defined range of <i>resources</i>, including people, money, equipment, materials and technologies. • Most of the impacts in the specific discipline are on wider issues and although occurring frequently are <i>specifically defined</i> and can be resolved by following established procedures.
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- Activities are *constrained* by operational context, defined work packages, time, finance, infrastructure, resources, facilities, applicable laws, standards and codes.
- Activities have *risks* and *consequences* that are locally important but are specifically defined.


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

- The work packages and associated parameters are *constrained* by operational context with variations limited to different locations only. (Cannot be covered by laws, standards and codes only).
- Even locally important minor risks can have far-reaching consequences.

Activities include design; planning; investigation and problem resolution; improvement of materials, components, systems and processes; engineering operations; maintenance; project management; and general management. For Specific Category Practitioners, research, development and commercialisation occur more frequently in some disciplines and are seldom encountered in others.

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3. OUTCOMES TO BE SATISFIED	Explanation and Responsibility Level
Group A: Engineering problem-solving	
Outcome 1: Define, investigate and analyse specifically defined engineering problems (tasks)	Responsibility Level E Analysis of an engineering problem means the 'separation into parts, possibly with comment and judgement'.
Level descriptor: <i>Specifically defined engineering problems</i> have the following characteristics: <ul style="list-style-type: none"> • Can be solved mainly by specific, practical, engineering knowledge that is underpinned by related theory And one or more of the following: <ul style="list-style-type: none"> • Are fully defined but require feedback • Are discrete, specifically focused tasks within engineering systems • Are routine, are frequently encountered and are in a familiar specified context And one or more of the following: <ul style="list-style-type: none"> • Can be solved in standardised or prescribed ways • Are encompassed by specific 	<ul style="list-style-type: none"> • A practical problem for the Specified Category Practitioner means the encountered problem cannot be solved by artisans because theoretical calculations and engineering decisions are necessary to substantiate the proposed solution. • Further investigation to identify the nature of the problem is seldom necessary. • Discrete means <i>individually distinct</i>: The problem is easily recognised as part of the larger engineering task, project or operation. • The problem is recognised to be within the specific scope and has occurred in the past or the work to be done is a standard operation; it is seldom something new. • Solving the problem does not require the development of a new solution. Determine how it was solved/done before. • Encompassed means <i>encircled</i>: Standards, codes and documented procedures must

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<p>standards, codes and documented procedures and require authorisation to work outside limits</p> <ul style="list-style-type: none"> Information is concrete, specific and largely complete but requires checking and possible supplementation Involve specific issues but few of these impose conflicting constraints and include a specific range of interested and affected parties <p>And one or both of the following:</p> <ul style="list-style-type: none"> Require practical judgement in specific practice areas in evaluating solutions and considering interfaces with other role players Have consequences that are locally important but are within a specified category (wider impacts are dealt with by others) 	<p>be obtained to solve the problem, and authorisation from the Responsible Professional/s must be obtained to waive the stipulations.</p> <ul style="list-style-type: none"> The responsibility lies with the Specified Category Practitioner to check that the information received as part of the instruction is correct and is added to as necessary to ensure the correct and complete execution of the work. The problem that is to be addressed by a Specified Category Practitioner must be limited to well-known, specific matters that need standardised solutions without possible complications. Practical solutions to problems include knowledge of the skills displayed by Practical Specialists and Engineering Artisans without sacrificing theoretical engineering principles and/or economising to satisfy the parties involved. Specified Category Practitioners must realise that their engineering actions may appear to be of local importance only but may cause further problems for which support from Engineering Professionals may be needed to manage the consequences.
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<p>Competency indicators: A structured analysis of specifically defined problems typified by the following performances within the competency area is expected:</p> <p>1.1 State how <u>you</u> interpreted the received work instruction, checking with your client or supervisor to ensure that your interpretation is correct</p> <p>1.2 Describe how <u>you</u> analysed, obtained and evaluated further clarifying information and state if the instruction was revised as a result</p>	<p>To perform an engineering task, a Specified Category Practitioner will typically receive an instruction from a senior person (customer) and must</p> <p>1.1 ensure that the instruction is complete, clear and within his/her capability and that the person who issued the instruction agrees with his/her interpretation; and</p> <p>1.2 ensure that the instruction and information to do the work is fully understood and is complete and establish that the engineering theory needed to understand the task, to carry it out and to check calculations and the acceptance criteria is not lacking. If needed, supplementary information must be gathered, studied and understood.</p>
<p>Range statement: The problem (task) may be part of a larger engineering activity or may stand alone. The design (planning) problem is amenable to solution by specific techniques that are practised regularly. This outcome is concerned with the understanding of a problem. Outcome 2 is concerned with the solution.</p>	<p>Please refer to sections 5 to 8 of the applicable Sub discipline-Specific Training Guide, document R-05-nnn-SC.</p>

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<p>Outcome 2: Design or develop (plan) sustainable solutions to specifically defined engineering problems (tasks)</p>	<p>Responsibility Level C Design means a 'drawing or outline from which something can be made'. Develop means 'come or bring into a state in which it is active or visible'.</p>
<p>Competency indicators: This outcome is normally demonstrated after a problem analysis as defined in Outcome 1. Working systematically to synthesise a solution to a well-defined problem typified by the following performances is expected:</p> <p>2.1 Describe how <u>you</u> designed or developed and analysed alternative approaches to do the work Check impacts and sustainability Attach calculations</p> <p>2.2 State the final solution to perform the work with which the client or supervisor were in agreement</p>	<p>The task given must be fully understood and interpreted; solutions must be developed (designed) for execution. To synthesise a solution means 'the combination of separate parts, elements, substances, etc. into a whole or into a system'.</p> <p>2.1 The development (design) of more than one way to do an engineering task or solve a problem should always be done and include the costing and impact assessment for each alternative. All the alternatives must meet the requirements set out by the instruction received, and <u>the theoretical calculations to support each alternative must be done and submitted as an attachment</u>. The alternatives must be within the imposed legal boundaries.</p> <p>2.2 The Specified Category Practitioner will in some cases be unable to support proposals with a complete theoretical calculation to substantiate every aspect and must in these cases refer his/her alternatives to a Professional for scrutiny and support. The recommended alternative must be convincingly detailed to win customer support. The selection of alternatives may be based on tenders that are submitted with alternatives that deviate from those specified.</p>
<p>Range statement: The solution conforms to specific and established methods, techniques or procedures within the specifically defined competency area. Engineering should not only consider decreasing</p>	<p>Applying theory to <i>specifically defined engineering</i> work is done in a way that has been used before (probably developed by Professionals in the past) and documented in written procedures, specifications, drawings, models, examples, etc. Specified Category Practitioners must seek approval and engineering verification for any deviation from</p>

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impacts but also restoring and regenerating through design.	these established methods.
Outcome 3: Comprehend and apply knowledge embodied in established specific engineering practices and knowledge specific to the field in which the applicant practices	Responsibility Level E Comprehend means 'to understand fully'. The jurisdiction in which a Specified Category Practitioner practises is given in sections 5 to 8 of the applicable Discipline-Specific Training Guide (document R-05-nnn-SC) .
Competency indicators: This outcome is normally demonstrated in the course of design, investigation or operations and is confined to the competency area. 3.1 State which HCert-level <u>engineering standard procedures and systems you</u> used to execute the work, and how HCert-level theory was applied to understand and/or verify these procedures 3.2 Give <u>your</u> own HCert-level theoretical calculations and/or reasoning for why the application of this theory is considered to be correct (Include actual examples)	Design (development) work for Specified Category Practitioners mainly involves utilising, configuring, certifying, testing and verifying manufactured components or proven engineering/management systems and repetitive design (development) work using an existing design (development) as an example. Specified Category Practitioners apply existing codes, policies and procedures in their design (development) work. Investigations are concerned with specifically defined incidents, condition monitoring and operations and mainly involve controlling, maintaining and improving engineering systems and operations. 3.1 The understanding of specifically defined procedures and techniques must be based on fundamental mathematical, scientific and engineering knowledge. The specific procedures and techniques that are applied to do the work must be given and accompanied by the underpinning theory. 3.2 Calculations confirming the correct application and utilisation of equipment and/or systems listed in the Subdiscipline-Specific Training Guide (document R-05-nnn-SC) must be done on practical, <i>specifically defined</i> activities. Reference must be made to the standards and the procedures used and how they were

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	derived from HCert-level theory.
<p>Range statement: Applicable knowledge includes the following:</p> <ul style="list-style-type: none"> • Technical knowledge that is applicable to the practice area irrespective of location and is supplemented by locally relevant knowledge, for example, established properties of local materials • A working knowledge of interacting disciplines confined to the competency area (Codified knowledge in related areas – financial, statutory, safety, management and sustainability) • Jurisdictional knowledge that includes legal and regulatory requirements and prescribed codes of practice 	<ul style="list-style-type: none"> • The specific location of a task to be executed is the most important determining factor in the layout design and the utilisation of equipment and/or systems. A combination of educational knowledge and practical experience must be used to substantiate any decisions taken together with a comprehensive study of the laws, policies, procedures, standards, environment, manpower, materials, components and projected customer requirements and expectations. • Despite having a working knowledge of interacting disciplines, Specified Category Practitioners must appreciate the importance of working with specialists, for example, Civil Engineers on structures and roads, Mechanical Engineers on fire protection equipment, Architects on buildings and Electrical Engineers on communication equipment. The codified knowledge in the related areas means working towards and understanding the requirements set out by specialists in the areas mentioned. • Jurisdictional in this instance means ‘having the authority’, and Specified Category Practitioners must adhere to the terms and conditions associated with each task that is undertaken. The Specified Category Practitioner may even be appointed as the ‘responsible person’ for specific duties in terms of the OHS Act.

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Group B: Managing engineering activities	Explanation and Responsibility Level
Outcome 4: Manage part or all of one or more <i>specifically defined</i> engineering activities	Responsibility Level E Manage means 'control'.
Competency indicators: The display of personal and work process management abilities within the competency area is expected: 4.1 State how <u>you</u> managed yourself, priorities, processes and resources in performing the work (e.g. bar chart) 4.2 Describe <u>your</u> contribution and role in the work team	In engineering operations and projects, Specified Category Practitioners will typically be given the responsibility to carry out specific tasks and/or complete projects. 4.1 Resources are usually subdivided based on availability and are controlled by a work breakdown structure and scheduling to meet deadlines. Quality, safety and environmental management are important aspects. 4.2 Depending on the task, Specified Category Practitioners can be the manager, the team leader or a team member and can supervise appointed contractors.
Outcome 5: Communicate clearly with others in the course of his/her specifically defined engineering activities	Responsibility Level E
Competency indicators: Demonstration of effective communication 5.1 State how <u>you</u> presented your point of view and compiled reports after completion of the work 5.2 State how <u>you</u> compiled and issued instructions to entities working on the same task	5.1 Refer to the range statement for outcomes 4 and 5. Presentation of point of view mainly occurs in meetings and discussions with the immediate supervisor. 5.2 Refer to the range statement for outcomes 4 and 5.

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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 the wider impacts of professional work. The audience includes peers, other disciplines, clients and stakeholders. Appropriate modes of communication must be selected. The Specified Category Practitioner is expected to perform the communication functions reliably and repeatedly within the competency area.

- (a) Planning means 'the arrangement for doing or using something considered in advance'.
- (b) Organising means 'put into working order; arrange in a system; make preparations for'.
- (c) Leading means to 'guide the actions and opinions of; to influence; to persuade'.
- (d) Implementing means to 'put an undertaking, agreement, or promise into effect'.
- (e) Controlling means 'regulating, restraining, keeping in order, checking'.

Specified Category Practitioners participate in writing or adhere to specifications for the purchase of materials and/or work to be done, make recommendation on tenders received, place orders and variation orders, write up work instructions, report back on work done, draw, correct and revise drawings, compile test reports, use operation and maintenance manuals to write up or apply work procedures, write inspection and audit reports, write commissioning reports, prepare and present motivations for new projects, compile budgets, report on studies done and calculations carried out, report on customer requirements, report on safety incidents and risk analysis, report on equipment failure, report on proposed system improvement and new techniques, report back on cost control, report on environmental impact and sustainability, etc.

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Group C: Impacts of engineering activity	Explanation and Responsibility Level
<p>Outcome 6: Recognise the foreseeable social, cultural, environmental and sustainability effects of <i>specifically defined</i> engineering activities</p>	<p>Responsibility Level D Social means ‘people living in communities; of relations between persons and communities’. Cultural means ‘all the arts, beliefs, social institutions, etc. characteristic of a community’. Environmental means ‘surroundings, circumstances, influences’. Sustainable is defined in the definitions below.</p>
<p>Competency indicators: This outcome is normally displayed in the course of analysis and solution of problems within the competency area:</p> <p>6.1 Describe the social, cultural and environmental impacts and the long-term sustainability of the engineering activity</p> <p>6.2 State how <u>you</u> communicated mitigating measures to affected parties and acquired stakeholder engagement</p>	<p>6.1 Engineering significantly affects the environment (e.g. servitudes, expropriation of land, excavation of trenches with associated inconvenience, borrow pits, dust and obstruction, street and other crossings, power dips and interruptions, visual and noise pollution, malfunctions, oil and other leaks, electrocution of human beings, detrimental effect on animals and wild life, dangerous rotating and other machines, demolition of structures).</p> <p>6.2 Mitigating measures taken may include environmental impact studies, environmental impact management, community involvement and communication, barricading and warning signs, temporary crossings, alternative supplies (ring feeders and bypass roads), press releases and compensation paid.</p>

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<p>Outcome 7: Meet all legal and regulatory requirements, protect the health and safety of persons and adhere to sustainable practices in the course of the trainee's specifically defined engineering activities</p>	<p>Responsibility Level E</p>
<p>Competency indicators:</p> <p>7.1 List the major laws and regulations that apply to the particular activity and indicate how sustainability practices and health and safety matters were managed</p> <p>7.2 State how <u>you</u> obtained advice in conducting risk management for the work and elaborate on the risk management system applied</p>	<p>7.1 The OHS Act is supplemented by a variety of parliamentary Acts, regulations, local authority by-laws, standards and codes of practice. Places of work may have standard procedures, instructions, drawings, and operation and maintenance manuals available. Depending on the situation (emergency, breakdown, etc.), these documents are consulted before the work commences and during the activity.</p> <p>7.2 It is advisable to attend a Risk Management (Assessment) course and to investigate and study the materials, components and systems used in the workplace. The Specified Category Practitioner seeks advice from knowledgeable and experienced specialists if any doubt exists that safety and sustainability cannot be guaranteed.</p>
<p>Range statement for outcomes 6 and 7: Impacts and regulatory requirements include the following</p> <ul style="list-style-type: none"> Impacts to be considered are generally those identified within the established methods, techniques or procedures used in the specific practice area. 	<ul style="list-style-type: none"> The impacts will vary substantially with the location of the task (e.g. the impact of laying a cable or pipe in the main street of town will be entirely different to the impact of construction in a rural area). The methods, techniques and procedures will differ accordingly, and this is identified and studied by the Specified Category Practitioner before starting the work.

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<ul style="list-style-type: none"> • Regulatory requirements are prescribed. • Prescribed risk management strategies must be applied. • Effects to be considered and methods used are defined. • Safe and sustainable materials, components and systems are prescribed. • Maintenance protocols are prescribed. • Persons whose health and safety are to be protected are located both inside and outside the workplace. 	<ul style="list-style-type: none"> • The Safety Officer and/or the Responsible Person appointed in accordance with the OHS Act usually confirms or checks that the instructions are in line with the regulations. The Specified Category Practitioner is responsible to ensure that this is done, and if not, to establish which regulations apply and ensure that they are adhered to. Usually, the people working on site are strictly controlled w.r.t. health and safety, but the Specified Category Practitioner must check that this is done. Tasks and projects are mainly carried out where contact with the public cannot be avoided and safety measures such as barricading and warning signs must be used and maintained. • Risks are mainly associated with elevated structures, subsidence of soil, electrocution of human beings, moving parts on machinery, fraud, corruption and theft. Risk management strategies are usually carried out by more senior staff but are also understood and applied by Specified Category Practitioners. • Effects associated with risk management are mostly well known if not obvious, and methods used to address them are clearly defined. • Usually, the safe and sustainable materials, components and systems are prescribed by Professionals or other specialists. It is the responsibility of the Specified Category Practitioners to use their knowledge and experience to check and interpret what is prescribed and thereafter to report anything that they are not satisfied with. • Maintenance systems and procedures from Codes of Practice and Manufacturer's Instructions must be drawn up. • Staff working on the task or project and persons affected by the engineering work being carried out must be protected.
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Group D: Exercise judgement, take responsibility and act ethically	Explanation and Responsibility Level
Outcome 8: Conduct engineering activities ethically	Responsibility Level E Ethical means 'grounded in the science of morality; moral soundness'. Morality means 'moral habits; standards of behaviour; principles of right and wrong'. Systematic means 'methodical; based on a system'.
Competency indicators: Sensitivity to ethical issues and adoption of a systematic approach to resolving these issues is expected: 8.1 State how <u>you</u> identified ethical issues, the affected parties and their interests and how you managed the situation when a problem arose 8.2 Confirm that <u>you</u> are conversant and compliant with the ECSA Code of Conduct and state why this is important in your work	8.1 Ethical problems that can occur include tender fraud, payment bribery, alcohol abuse, sexual harassment, absenteeism, favouritism, defamation, fraudulent overtime claims, fraudulent expenses claimed, fraudulent qualifications and misrepresentation of facts. 8.2 The ECSA Code of Conduct, as specified on the ECSA website, is known and adhered to. Applicable examples are given.

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<p>Outcome 9: Exercise sound judgement in the course of <i>specifically defined</i> engineering activities</p>	<p>Responsibility Level E Judgement means ‘good sense: ability to judge’.</p>
<p>Competency indicators: Exhibition of judgement is expected:</p> <p>9.1 State the factors applicable to the work, their interrelationship and how <u>you</u> applied the most important factors</p> <p>9.2 Describe how <u>you</u> foresaw work consequences and evaluated situations in the absence of full evidence</p>	<p>9.1 The extent of a project or task given to a junior Specified Category Practitioner is characterised by the limited number of factors and their resulting interdependence. The junior Specified Category Practitioner will seek advice if educational and/or experiential limitations are exceeded. Examples of the main engineering factors applied must be given.</p> <p>9.2 Risky decisions will lead to equipment failure, excessive installation and maintenance cost, damage to persons and property, bankruptcy, poor service delivery, etc. Give examples.</p>
<p>Range statement for outcomes 8 and 9: Judgement is expected within the application of the candidate’s category-specific methods, techniques and procedures and in the assessment of their immediate impacts. Judgement in decision-making involves</p> <ul style="list-style-type: none"> • consideration of limited risk factors, some of which may be ill-defined; or • consequences that are in the immediate work 	<p>In engineering, about 15% of the activities can be classified as <i>specifically defined</i> and for which the Specified Category Practitioner uses standard procedures, codes of practice, specifications, etc. Judgement must be displayed to identify any activity falling outside the <i>specifically defined</i> range (defined above) by the following:</p> <ul style="list-style-type: none"> • Advice is sought when risk factors exceed the capability of the trainee. • Consequences outside the immediate work contexts (e.g. long-term) are not

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contexts; or <ul style="list-style-type: none"> consideration of the identified set of interested and affected parties with defined needs. 	normally handled. <ul style="list-style-type: none"> Interested and affected parties with defined needs outside the <i>specifically defined</i> parameters are considered.
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Outcome 10: Be responsible for making decisions on part or all of one or more <i>specifically defined</i> engineering activities	Responsibility Level E Responsible means 'legally or morally liable for carrying out a duty; the care of something or somebody in a position where one may be blamed for loss, failure, etc.'
Competency indicators: Responsibility is displayed by the following performance: <ul style="list-style-type: none"> 10.1 Show how <u>you</u> used HCert-level theoretical calculations to justify decisions taken in performing engineering work. Attach actual calculations. 10.2 State how <u>you</u> took responsible advice on any matter falling outside your own education and experience 10.3 Describe how <u>you</u> took responsibility for your own work and evaluated any shortcoming in <u>your</u> output 	<ul style="list-style-type: none"> 10.1 Calculations, for example, fault levels, load calculations, losses, return on investment are done to ensure that the correct material and components are utilised. 10.2 Specified Category Practitioners do not operate on tasks at a higher level than <i>specifically defined</i> and consult professionals if elements of the tasks to be done are beyond their education and experience (e.g. power system stability, legal actions). 10.3 In the first instance continuous self-evaluation to ascertain that the task given is done correctly, on time and within budget. Continuous feedback to the originator of the task instruction and corrective action if necessary form important elements.
Range statement: Responsibility must be	The responsibility is mainly allocated within a team environment, with an increasing

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discharged for significant parts of one or more <i>specifically defined</i> engineering activities.	designation as experience is gathered.
Note 1: Responsibility for the evaluation of work in a supervisory capacity	

Group E: Initial Professional Development (IPD)	Explanation and Responsibility Level
Outcome 11: Undertake independent learning activities sufficient to maintain and extend competence	Responsibility Level D
Competency indicators: Self-development managed by the following: 11.1 Provide the strategy that <u>you</u> will adopt independently to enhance your professional development (IPD report) 11.2 Be aware of the philosophy of the employer in regard to professional development	11.1 If possible, a specific field of the sub discipline is chosen, available developmental alternatives are established, a programme is drawn up (in consultation with employer if costs are involved) and options available to expand knowledge into additional fields are investigated. 11.2 Record-keeping must not be left to the employer or any other person. Trainees must manage their training independently, taking the initiative and being in charge of experiential development towards Specified Category Practitioner registration level. Knowledge of the employer's policy and procedures regarding training is essential.

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<p>Range statement: Professional development involves</p> <ul style="list-style-type: none"> • taking ownership of own professional development; • planning own professional development strategy; • selecting appropriate professional development activities; and • recording professional development strategy and activities while displaying independent learning ability. 	<ul style="list-style-type: none"> • This is <u>your</u> professional development; it is not the responsibility of the organisation that you are working for. • In most places of work, training is seldom organised by a training department. It is the responsibility of Specified Category Practitioners to manage their own experiential development. Specified Category Practitioners frequently find themselves in situations in which no further progress is possible and are left behind doing repetitive work. If self-development is not self-driven, success is unlikely. • Preference must be given to engineering development rather than developing soft skills. • Developing a learning culture in the workplace environments of Specified Category Practitioners is vital to their success. Information is readily available, and most senior personnel in the workplace are willing to mentor if approached.
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