ECSA

ENGINEERING COUNCIL OF SOUTH AFRICA

Discipline-Specific Training Guide for Registration as a Professional Certificated Engineer (Mine Managers)

R-05-MM-PCE

REVISION No.1: 05 November 2025

TABLE OF CONTENTS

TABLES

DEFINITIONS

Alternative Route: Refers to an applicant who aspires to become registered in a Candidate or Professional Category but does not have the accredited or recognised qualifications and who proposes to meet the educational requirement through further study and assessment.

Applicant means a person with a GCC (Factories) with at least 3 years appropriate practical engineering experience in a factory or plant at the level of *broadly defined* engineering problems and who also has held a legal appointment in a factory or plant for at least one year.

Benchmark Route: The normal process required to attain registration that consists of the completion of an accredited, recognised or evaluated equivalent qualification and a well-structured and effectively executed programme of training and experience for the category of registration.

Candidate means a person who has obtained a Government Certificate of Competence as a Mine Manager.

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

Discipline, in terms of the Professional Certificated Engineer, means Factories, Mines & Works, Mine Manager, and Marine.

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.

Engineering Professions Act: The Engineering Professions Act, 46 of 2000 and any regulations issued in terms thereof.

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

Integrated performance means that an overall acceptable outcome of an activity requires several outcomes to be satisfactorily attained, for example, a design requires 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 in Mining Operations means the coordinated activities required to:

(a) direct and control one or more activities that are in line with management activities in Mining Operations

(b) ensuring health and safety of personnel within area of responsibility, that the mine is designed, constructed and equipped for safe operational working a healthy working environment

(c) ensure the return of equipment to an acceptable condition by the renewal, replacement or mending of worn, damaged or decayed parts

(d) ensure that the mine is commissioned, operated, maintained and decommissioned in such a way that employees can perform their work without endangering the health and safety of themselves or of any person

(e) ensure that equipment is maintained in a state in which it can be used to perform its required function.

Over-determined problem means a problem of which the 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 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.

Professional categories mean the categories of registration as defined in clause 18(1) of the Engineering Professions Act, 46 of 2000, namely Professional Engineer, Professional Engineering Technologist, Professional Certificated Engineer and Professional Engineering Technician.

Professional Certificated Engineer: A person registered in that category in terms of sections 18(1)(a)(iii) of the Engineering Professions Act.

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.

ABBREVIATIONS

CPD	Continuing Professional Development
DMPR	Department of Minerals and Petroleum Resources
DSTG	Discipline Specific Training Guides
ECSA	Engineering Council of South Africa
EPA	Engineering Profession Act, 46 of 2000
DMRE	Department of Minerals Resources and Energy
FIDIC	International Federation of Consulting Engineers
FSS Code	Fire Safety Systems Code
GCC	Government Certificate of Competence
HVAC	Heating, Ventilating and Air-Conditioning

IPD	Initial Professional Development
MHSA	Mines Health and Safety Act, 29 of 1996
NEC	New Engineering Contract
PCE	Professional Certificated Engineer
VA	Voluntary Association

BACKGROUND

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.

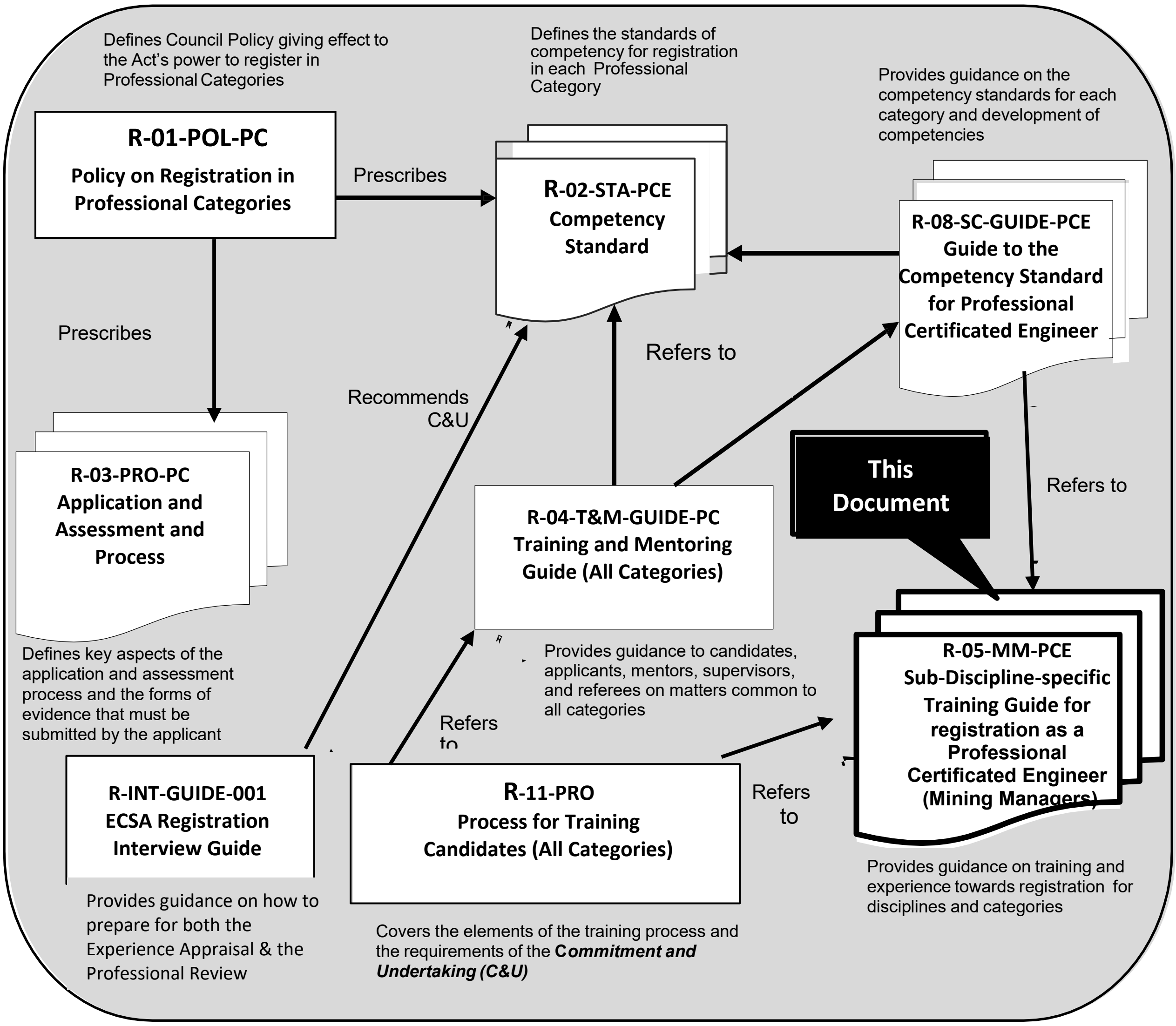

Figure 1: Documents defining the ECSA Registration System

1. PURPOSE OF THIS DOCUMENT

All persons applying for registration as Professional Certificated Engineers are expected to demonstrate the competencies specified in the Competency Standard for Registration in Professional Category (**R-02-STA-PCE**) at the prescribed level, irrespective of the trainee's discipline, through work performed by the applicant at the prescribed level of responsibility.

This document supplements the generic *Training and Mentoring Guide for Professional Categories* (**R-04-T&M-GUIDE-PC**), the *Guide to the Competency Standards for Professional Certificated Engineers* (**R-08-CS-GUIDE-PCE**) and *Process for Training Engineering Candidates towards Professional Registration* (**R-11-PRO**).

In document **R-04-T&M-GUIDE-PC**, attention is drawn to the following sections:

- 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-CS-GUIDE-PCE** provides both a high-level and an outcome-by-outcome understanding of the competency standards as an essential basis for this Discipline-specific Training Guide (DSTG). This DSTG, as well as **R-04-T&M-GUIDE-PC** and **R-08-CS-GUIDE-PCE**, are subordinate to the *Policy on Registration in Professional Categories* **(R-01-POL-PC)**, the **R-02-STA-PCE** and the *Processing of Applications for Registration of Candidates and Professionals* **(R-03-PRO-PC)**. Document **R-11-PRO** elaborates on the elements of the training process.

2. PERSONS WHO WISH TO REGISTER AS PROFESSIONAL CERTIFICATED ENGINEERS (APPLICANTS)

This DSTG is directed at persons who are training and gaining experience towards registration, as stipulated by council in policy **R-01-POL-PC**, and is specifically applicable to persons holding a Mine

Manager's Certificate of Competency issued in terms of the Mine Health and Safety Act, Act 29 of 1996 (as opposed to Factories Engineers, Mine Engineers and Chief Marine Engineer Officer, which are dealt with in respective DSTGs).

In the absence of an internal mentor for an applicant, the services of external mentors are advisable. Alternately, the Voluntary Associations (VAs) for this specific discipline should be consulted for assistance in locating an external mentor. A mentor must be kept abreast of all stages of the development process of mentees under their care.

Applicants must have:

- completed the educational requirements as laid down by the Chief Inspector in terms of the Certificate of Competency Regulations made under the Mine Health and Safety Act, 29 of 1996
- attained a Mine Manager's Certificate of Competency issued by the Department of Mineral Resources and Energy (DMPR)
- 3 years of practical engineering experience at the level of *broadly defined* engineering problems
- been appointed for at least 1 year as a competent person in terms of Section 3.1(a), 4.1 or 2(a) where they are required in terms of their appointment to assume the responsibilities of the Regulation 2.6.1 appointee where a Mine Manager's Certificate of Competency is required in terms of the Mines Health and Safety Act, 29 of 1996, **or** in the case of an occupational health and safety inspector legally appointed in terms of the Mines Health and Safety Act, 29 of 1996, to administer the Act on mines, appointed for at least 3 years to carry out health and safety inspections and incident investigations.

Although this DSTG is written for the recent graduate who is training and gaining experience towards registration as stipulated by ECSA in the policy **R-01-POL-PC**, mature applicants for registration may apply the guide retrospectively to identify possible gaps in their development.

To achieve ECSA professional registration, an applicant should endeavour to achieve the following:

- Exposure to experience to be able to apply the engineering theory acquired during educational development to practical workplace situations.

- Exposure to an increasing level of responsibility to enable the applicant to submit evidence in the training and experience reports of achieving the duration and level detailed in Sections **6.2** and **6.3** (see also **Table 2**).
- Develop the engineering competency to cover the eleven outcomes in the five major groups referred to in Section 6.2 and Annexure A, and the discipline specific requirements referred to Sections **6.3** and **7.6**.

Any applicants who have not been through a mentorship programme are advised to request an experienced mentor (internal or external) to act as an application adviser while they prepare their application for registration.

The DSTG may also 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 **7.5** of this document). Two certificates of competency are issued in terms of legislation and the minimum duration of education, training and experience is laid out in the **Table 1**. below:

Table 1: Minimum duration of education, training and experience towards registration:

Pathway	Qualification	Post qualification total training & experience in specific subdiscipline	Post qualification experience (part of total) with legal appointment
Benchmark Route	1. Mine Manager's Certificate of Competency (Metalliferous) issued in terms of the Mines Health and Safety Act 2. Mine Manager's Certificate of Competency (Coal) issued in terms of the Mines Health and Safety Act	3 years	1 year in the case of a mine manager, **or** 3 years in the case of a MHS inspector who is legally appointed in terms of the Mines Health and Safety Act, 1996, and is holding a Mine Manager's Certificate of Competency
Notes:	a) Training and experience must incorporate legal requirements stipulated in laws, regulations and standards applicable. b) Training and experience must incorporate practical requirements executed to meet any legal requirements applicable to the particular legal appointment.		

Pathway	Qualification	Post qualification total training & experience in specific subdiscipline	Post qualification experience (part of total) with legal appointment
	c) A legal appointment, which requires possession of a Government Certificate of Competency, as a Manager in terms of Section 3.1(a), 4.1 or 2A of the Mines Health and Safety Act, 29 of 1996, or of Regulation 2.6.1, or in terms of any Act which preceded or superseded any of the Acts mentioned above, and which demonstrates the applicant's competence to implement and manage the provisions of these Acts, and ensure the safe operation and maintenance of plant and equipment for at least 1 year, or in the case of a Mine Manager legally appointed in terms of the Mine Health and Safety Act, 29 of 1996, to administer the Act on a mine with at least 3 years in this appointment. d) Experience gained in operations, maintenance, appropriate processes and systems, trouble shooting and problem solving, failure analysis and incident investigations, construction and commissioning, training and project management, provided that at least 2 of the required 3 years of experience are directly concerned with the installation, operation and/or maintenance of machinery which requires sound engineering judgement, ability to work in a team, sound communication skills and management and which demonstrates the applicant's competence at the required level of a certificated engineer over the full three year period.		

3. PERSONS WHO WISH TO REGISTER AS CANDIDATE CERTIFICATED ENGINEERS WITH ECSA (CANDIDATES)

This DSTG is also directed at persons who have recently obtained a Mine Manager's Certificate of Competency with no or minimum post graduate experience. If such person wishes to register with ECSA as a Candidate Certificated Engineer to eventually obtain professional registration, the requirements in this DSTG must be followed by him or her as well as his or her supervisors and mentors. It is intended to support a programme of training and experience incorporating good practice elements.

Such a person must have:

- completed the educational requirements laid down by the Chief Inspector in terms of the Certificate of Competency Regulations made under the Mine Health and Safety Act, 29 of 1996
- attained a Mine Manager's Certificate of Competency (Metalliferous or Coal Mines) issued by the Department of Minerals and Petroleum Resources (DMPR)

- after registering as a Candidate Certificated Engineer, embarked on a process of acceptable training under a mentor guiding the professional development process at each stage as indicated in this guide.

4. ORGANISATIONAL FRAMEWORKS FOR OCCUPATION

Certificated Engineers (Mining) Organising Framework for Occupations

Certificated Engineers ensure, as far as reasonably practicable, that the mine is designed, constructed and equipped:

- to provide for safe operation and healthy working environment and
- with a communication system and with electrical, mechanical, renewable energy, and other equipment as necessary to achieve those conditions and ensure as far as reasonably practicable, that the mine is commissioned, operated, maintained and decommissioned in such a way that employees can perform their work without endangering the health and safety of themselves or any other person.

Applicants must be knowledgeable and experienced with the following plant, equipment, practices and processes at the mines with emphasis on the general design, layout, production capacity, reticulation, energy requirements, economic operation, efficiency testing, commissioning, asset lifecycle management, maintenance, safety precautions and safety devices and equipment.

- Legal liability and responsibility associated with the safe operation and a healthy working environment as a competent person appointed (Sections 2A(1), 3.1(a), 4.1 or Regulation 2.6.1 in terms of the Health and Safety Act, 29 of 1996) or in the case of an occupational health and safety inspector legally appointed in terms of the Occupational Health and Safety Act, 85 of 1993, to administer the Act in industry with at least **3 years** in this appointment to carry out health and safety inspections and incident investigations and the assurance of compliance with this legislation and related regulations.
- Risk management including base-line risk assessment, accident prevention, management of safe work permit system.

- Organisation of the Mining function, with respect to principles of maintenance, classification of maintenance work, work identification, asset lifecycle management, inventory control and maintenance spare parts, training and other human resources tasks, management of security measures, budgeting and cost control, maintenance and repair strategy.
- Review and sign-off proof of competency of all employees, contractors and contractor employees before such persons are allowed to perform any functions/tasks that may cause injury or damage to persons/machinery or equipment.
- Review Codes of Practice, Standard Procedures, Safe Working Practices and other documents on a regular systematic basis.

It must be emphasised that a Mining Certificated Engineer is a multi-disciplined generalist with the legal responsibility to ensure mining operations and equipment are safely operated and maintained through training, experience, qualification, and certification.

5. NATURE AND ORGANISATION OF THE INDUSTRY AND TRAINING IMPLICATIONS

Professional Certificated Engineers may be employed in both the private and public sectors and have legal appointments as competent persons.

Typically, in the private sector, they would be involved in consulting and contracting, or in supplier or manufacturing organisations. Engineering consultants are responsible for planning, designing, documenting and supervising the construction of projects on behalf of their clients. Engineering contractors are responsible for project implementation, and activities include planning, construction, labour and resource management. Those working in supply or manufacturing companies could be involved in research and development and would be involved in production, supply and quality control.

The public sector is responsible for service delivery and is usually the client, though in some departments, design and construction is also carried out. Certificated Engineers are required at all levels of the public sector, including at national, provincial, and local government level, state-owned enterprises and public utilities. The public sector largely handles planning, specifying, overseeing implementation, operations, and maintenance of infrastructure, as well as inspectors carrying out inspections and investigations in industry.

An extension of the public sector would include tertiary academic institutions and research organisations. Depending on where an applicant is employed, there may be situations where the opportunities in-house are insufficiently diverse to develop all the competencies required in both Groups A and B noted in document **R-02-STA-PCE**. For example, the opportunity to develop problem solving competence (including design or developing solutions) and to manage engineering activities (including implementing or constructing solutions) may not both be available to the applicant. In such cases, employers are encouraged to appoint an external mentor.

It has been fairly common practice that where an organisation is unable to provide training in certain areas secondments are arranged with other organisations, so that applicants are able to develop all the competencies required for registration.

These secondments are usually reciprocal in nature so both employers and their employees get mutual benefit from the other party. Secondments between consultants and contractors, and between the public and private sectors should be possible.

5.1 Investigation and problem analysis

Problem solving in design, operational, maintenance, construction and research environment is the core of engineering. A logical thinking process requires Certificated Engineers to apply their minds diligently in bringing solutions to technical *broadly defined* problems. This process involves the analysis of systems or assembly of plant and equipment components and integration of various elements in mechanical and electrical engineering through the application of basic and engineering sciences.

Applicants are required to demonstrate the insight and ability to use and interface various design aspects through verifiable work carried out in providing engineered and innovative solutions to practical *broadly defined* problems experienced in their operating work environment.

In addition, applicants must develop the skills required to demonstrate the advanced use of Mechanical Engineering knowledge in optimising the efficiency of operations or the constructability of projects.

Applicants must be able to demonstrate they have been actively involved in a plant environment participating in the execution of practical work such that they have learnt sufficient details of basic engineering procedures to be able to exercise judgment in the workplace thereafter.

Applicants must show evidence of adequate training in this function through *broadly defined* project work carried out in the analysis of problems and the synthesis of solutions. Evidence is required in the form of a separate comprehensive design report that should accompany the application. This report should describe a synthesised solution to sufficiently *broadly defined* engineering problems to demonstrate that applicants have had an opportunity to apply their technical knowledge and engineering expertise gained through university education and practical work experience. In applying technical and scientific knowledge gained through academic training, applicants must also demonstrate the financial and economic benefits of engineered solutions synthesised from scientific and engineering principles at a sufficiently advanced level.

What is a sufficiently broadly defined engineering problem?

"Broadly defined" in *broadly defined* engineering problems can be defined as follows:

> "Composed of many ***inter-related conditions***; requiring ***underpinning methods, procedures and technical judgment*** to create a solution within a set of ***originally broadly defined circumstances***."

Plant engineering forms an integral part of broader engineering systems and infrastructure in technologically complex manufacturing, processing, construction, product development and research environments. Applicants are required to undertake diverse engineering projects that significantly enhance the operability and constructability of integrated engineering systems and infrastructure. Such project work must not be a stand-alone type of assignment but should be part of a solution to integrated engineering systems that requires a broader application of various theoretical aspects of plant engineering, ranging from fluid systems, processes and energy systems to structures, asset management and plant and equipment.

The design is a logical thinking process that requires Certificated Engineers to apply their minds carefully in bringing solutions to technically *broadly defined* problems. This process involves analysis of systems or assembly of plant and equipment components and integration of various elements and processes through the application of basic and engineering sciences.

Simple, straightforward calculation exercises and graphical representations from computer-generated data are not considered as sufficiently *broadly defined* engineering designs because anybody with qualifications in basic science and engineering science could perform this kind of work, whereas professional registration requires advanced application of engineering knowledge in *broadly defined* design problems.

As part of demonstrating advanced application of theoretical knowledge with respect to these systems, applicants must incorporate calculations with clearly defined inputs to the formulae used and detailed interpretation of the results obtained. They must demonstrate how the calculated results have been used to provide the solution to the problem at hand and the economic benefit to the project or the operating work environment.

Applicants must obtain experience in solving a variety of problems in their work environment, and the solution to these problems should involve the use of fundamental and advanced plant engineering knowledge obtained at a tertiary educational institution. The problems that require scientific and engineering approach to solve them may be encountered in any engineering work environment that consists of integrated engineering systems, equipment, machinery and infrastructure. From their early training years, candidates must actively seek opportunities to obtain experience of synthesising solutions to real life engineering problems encountered in the workplace.

A suitable period of time and degree of practical participation should also be sought in the workshop environment learning the basic practices that are the essence of the mechanical and electrical discipline so that the applicant can judge the efficacies of such practices in the general workplace thereafter.

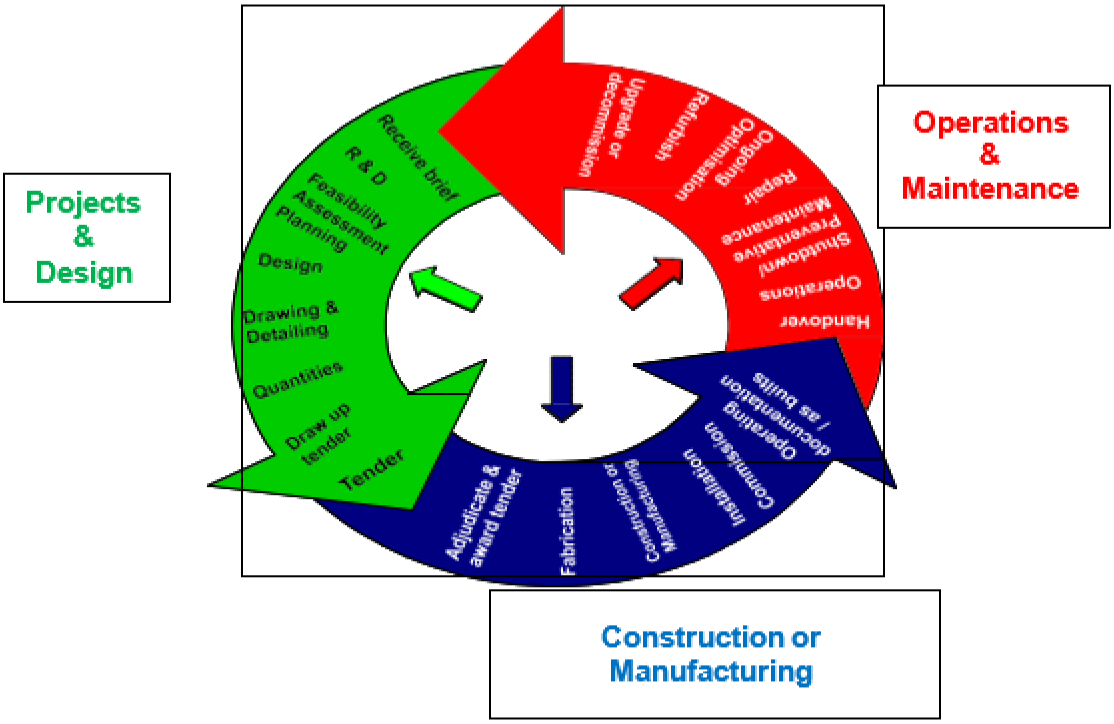

Figure 2: Conventional stages of the project (or product) life cycle

Applicants are not expected to change their occupation to work in all the areas listed above. Applicants must, however, ensure that in whatever area they are employed, they undertake tasks that provide experience in all the 11 outcomes where competencies are assessed.

In **APPENDIX B,** a generic schematic is presented for the outcomes applicable to all disciplines that an applicant should become competent to do in the various phases of a project or task:

(a) Solving problems based on broadly defined engineering and contextual knowledge.

(b) Managing engineering activities.

(c) Understanding risks and impacts of engineering activities.

(d) Judgement, responsibility and ethical behaviour during engineering activities.

(e) Further professional development since graduation.

5.2 Design and manufacturing

Examples of acceptable designs, development and manufacturing include but are not limited to the following:

- Broadly defined electrical systems, mechatronics, automation and illumination
- Broadly defined fluid systems, which includes rotating or reciprocating machines
- Broadly defined machines/equipment or major parts thereof
- Broadly defined energy systems involving heat transfer
- Broadly defined pressure systems/HVAC systems
- Broadly defined structures and plant layout
- Broadly defined material transfer and storage systems.

Broadly defined design reviews include reviews of major machine systems such as turbines/compressors with their auxiliary systems, power station systems and their major components, steam generating plant and auxiliary equipment, *broadly defined* refrigeration systems, petrochemical and other production, manufacturing plant systems and the like.

5.3 Operations and maintenance

Operations and maintenance mostly deal with investigating failure or underperformance of major equipment or systems and the synthesis of implemented and proven solutions to avoid recurrence of the problem. In addition, this category of work also involves the improvement projects necessary for optimising the operational efficiencies. When performing the aforementioned work, a Certificated Engineer must apply professional engineering judgment to all work done in the management of operations. This includes but is not limited to the ability to assess design work against the following criteria:

- conformance to design specifications;

- conformance to health and safety regulations
- ease of fabrication and assembly
- constructability
- maintainability
- conformance to environmental requirements
- ergonomic considerations
- life cycle costs
- fit for purpose
- alternative solutions.

5.4 Research and development

This type of work may be performed in research and product development centres of business organisations or at the academic institutions. Applicants must undertake research and development work that is predominantly mining operations in nature, and this work must include an in-depth application of the various aspects of mining operations, including operation and maintenance of equipment, and product or system testing under controlled experimental conditions.

5.5 Risk management and impact mitigation

The potential impact of ethically bound and evaluated Certificated Engineers who are professionally registered and conducting their daily duties in a prescribed manner is incalculable. Their proactive identification of potential hazards and risks/incidents definitely leads to fewer incidents/accidents, as well as minimising loss of life and injury and lost productivity with a reduction in environmental impacts.

The following steps should be considered when performing broadly defined plant engineering tasks:

- Risk Management process during project management or plant operation or performing any engineering task by considering social, cultural, environmental, legal and regulatory requirements.

- Certificated Engineers may be involved in risk management, identification and analysis within the plant, system or project life cycle.
- Undertaking risk assessments prior to conducting plant maintenance, test work, installations, renovations, demolition or operations.
- Compiling risk assessment plans, risks registers, risk mitigation plans and work permits.
- Using risk analysis tools to undertake risk impact and analysis and develop impact mitigation strategies.
- Consideration of risk attributes or factors during risk assessments such as cost, programme, quality, labour, profitability, logistics, political, social, cultural and environmental, legislation, technology, etc.
- In process safety engineering, inherent safety risk is thought of during risk response and control processes.
- Compilation of risk management stakeholder and communication plan.
- Statutory review and compliance

6. DEVELOPING COMPETENCY: DOCUMENT R-08-CS-GUIDE-PCE

6.1 Contextual knowledge

Applicants are expected to be aware of the requirements of the engineering profession. The VAs applicable to Certificated Engineers and their functions and services to members, for example, provide a broad range of contextual knowledge for Candidate Certificated Engineers through the Professional Certificated Engineer's full career path. The profession identifies specific contextual activities considered essential to the development of a Certificated Engineer's competence. These include awareness of basic workshop, manufacturing and fabrication activities and the competencies required of the engineer, technologist, technician and artisan. Exposure to practise in these areas is identified in each programme within the employer environment.

ECSA's Professional Certificated Engineer Registration peer evaluation process carries out the assessment, review and moderation of an applicant's portfolio of evidence at the completion of the training period.

6.2 Functions performed and Degree of Responsibility

Special considerations in the discipline, subdiscipline or specialty must be given to the competencies specified in the following groups as described in the Degree of Responsibility scales in document **R-04-T&M-GUIDE-PC.**

The following competencies are specified for the groups in **Table 2**:

- Group A: Knowledge based problem solving (this should be a strong focus)
- Group B: Management and Communication
- Group C: Identifying and mitigating the impacts of engineering activity
- Group D: Judgement and responsibility
- Group E: Independent learning.

It is useful to measure the progression of an applicant's competency by using the scales for Degree of Responsibility, Problem Solving and Engineering Activity as specified in the relevant documentation.

APPENDIX B has been developed against the Degree of Responsibility Scale. Activities should be selected to ensure applicants reach the required level of competency and responsibility. It should be noted that an applicant working at the Degree of Responsibility Level E carries the responsibility appropriate to that of a registered person except that the applicant's supervisor is accountable for the applicant's recommendations and decisions. The nature of work and Degrees of Responsibility defined in document **R-04-T&M-GUIDE-PC** are used here (and in **APPENDIX B** below):

Table 2: Nature of work and degrees of responsibility

	A: Being Exposed	B: Assisting	C: Participating	D: Contributing	E: Performing
Task	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.

	A: Being Exposed	B: Assisting	C: Participating	D: Contributing	E: Performing
Responsibility	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, including the legal appointment.

The mentor and applicant must identify at which level of responsibility an activity provides compliance with and demonstration of the various outcomes. Evidence of an applicant's activities and acceptance by the mentor must be recorded on the appropriate system such that it meets the requirements of the Training Elements **APPENDIX B**. ECSA specifies the applicable recording system.

6.3 Discipline-specific requirements

Activities should be selected to ensure that applicants reach the required level of competency and responsibility. It is useful to measure the progression of an applicant's competency using the Degree of Responsibility, Problem Solving and Engineering Activity scales as specified in the relevant documentation and outlined in **Table 2**.

Degree of Responsibility E means performing at the level required for registration. This corresponds to the range statement in outcome 10 in the Competency Standard **R-02-STA-PCE**, which requires applicants to display responsibility "for the outcomes of significant parts of one or more *broadly defined* engineering activities".

It should be noted that applicants working at Responsibility level E on the Degree of Responsibility Scale carry the responsibility for work thus performed appropriate to that of a registered person except that the Candidate *Certificated Engineer's* supervisor is accountable for the Candidate's recommendations and decisions. Applicants must provide proof of their legal appointment as competent person.

6.4 Statutory and regulatory requirements

Applicants are expected to have a thorough knowledge of the Health and Safety Act, 29 of 1996, as amended, as this is a requirement for the Mine Manager's Certificate of Competency, and to have a working knowledge of the following regulations and Acts and how they affect their working environment:

- Engineering Profession Act, 46 of 2000,
- Engineering Council of South Africa – its Rules and the Code of Conduct;
- Basic Conditions of Employment Act, 75 of 1997;
- Compensation for Occupational Injuries and Diseases Act, 130 of 1993
- Employment Equity Act, 55 of 1998
- Environment Conservation Act, 73 of 1989, as amended;
- Mine Health and Safety Act, 29 of 1996;
- Department of Minerals Resources and Energy (DMRE) guidelines issued under Mine Health and Safety Act, 29 of 1996
- Labour Relations Act, 66 of 1995
- National Environmental Management Act, 107 of 1998

Many other Acts not listed here may also be pertinent to an applicant's work environment. Applicants are expected to have a basic knowledge of the applicable Acts and to investigate whether any Acts are applicable in the particular work environment.

6.5 Recommended formal learning activities

Applicants should register with the relevant VA to access lists of training, conferences and seminars and other relevant information. The following list of formal learning is a sample of useful course types:

- CPD courses on specific disciplines
- Occupation health and safety legal liability
- Asset Life Cycle Management
- Project management
- Value engineering
- Standard conditions of contract: NEC, FIDIC, GCC etc.
- Preparation of specifications
- Negotiation skills
- Engineering finance
- Risk analysis
- Quality systems
- Energy efficiency
- Water management and treatment
- Maintenance engineering
- Environmental impacts management
- Engineering management
- Technical report writing
- Professional skills report writing and communication planning methods
- Computers and IT knowledge
- Construction regulations
- Problem solving and analysis tools.

7. PROGRAMME STRUCTURE AND SEQUENCING

7.1 Best practice

Best practice is a developmental process that assists applicants to become registered Professional Certificated Engineers. Best practice comprises the process for continuous development of applicants. A number of courses (technical and managerial) must be attended to gain the Initial Professional Development (IPD) points required for registration. This is in addition to on-the-job learning at the organisation where the Applicant is employed. Refer to the DMRE and Minerals Council of South Africa (formerly Chamber of Mines), Mine Health and Safety Council for best practice ideas. Applicants may register with these bodies to gain access to courses, articles and relevant information for their development. This may also extend to the opportunity to meet with experts during seminars.

It is suggested that applicants work with their mentors to select appropriate plant and equipment types to gain exposure to eventual responsibility, such as inspection and load testing on the lifting machines, boiler inspections, other statuary inspections, etc. A regular reporting structure with suitable recording of evidence of achievement against the competency outcomes and responsibility should be in place.

No ideal training programme structure or unique sequencing constitutes best practice. The training programme for each applicant depends on the work opportunities available at the time for the employer to assign to the applicant.

It is suggested that applicants work with their mentors to determine appropriate projects to gain exposure to elements of the asset cycle to ensure that their *broadly defined* developments or designs are constructible, operable and designed considering life cycle costing and long-term sustainability.

The training programme should be such that applicants progress through the levels of work capability described in document **R-04-T&M-GUIDE-PC**, such that by the end of the training period, applicant must perform individually and as a team member at the level of problem solving and engineering activity required for registration and exhibit Degree of Responsibility Level E. The nature of work and Degrees of Responsibility are defined in document **R-04-T&M-GUIDE-PC**.

The mentor and the applicant must identify the level of responsibility an activity provides compliance with and demonstration of the various outcomes. Evidence of the applicant's activities is recorded on the appropriate system such that it meets the requirements of the Training Elements **APPENDIX** B.

Depending on the nature and extent of the engineering-related work an employer undertakes, the employer should be able to develop applicant-specific development programmes that provide opportunities for applicants to undertake the necessary exposure/experience in a phased approach.

7.2 Realities

Generally, irrespective of the discipline, it is unlikely that the training period will be 3 years – the minimum time required by ECSA. Typically, it will be longer and is determined among others by the availability of functions in the actual work situation.

Each applicant effectively undertakes a unique programme where the various activities carried out at the discipline-specific level are then linked to the generic competency requirements of **R-08-CS-GUIDE-PCE** and the compulsory discipline-specific requirements to be met during the candidacy/work experience.

7.3 Generalists, specialists, researchers and academics

Document **R-08-CS-GUIDE-PCE** adequately describes what would be expected of persons whose formative development has not followed a conventional path, for example academics, researchers, specialists, inspectors and those who have not followed a candidate training programme.

The overriding consideration is that, irrespective of the route followed, applicants must provide evidence of competence against the standard.

7.4 Orientation requirements

- Company Safety Regulations
- Company Code of Conduct
- Company Staff Code and Regulations
- Company records and record keeping
- Typical functions and activities in the company
- Incident investigations
- Hands-on experience and orientation in each of the major company divisions.

7.5 Moving into or changing candidacy programmes

This DSTG assumes that Candidate Certificated Engineers enter a programme after attaining the Certificate of Competency and after holding a legal appointment as noted in section **2** of this document and continues with the programme until ready to submit an application for registration. It assumes that candidates are supervised and mentored by persons who meet the requirements in document **R-04-T&M-GUIDE-PC**. 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 be completed:

- The candidate must complete the Training and Experience Summary (TES) and Training and Experience Reports (TERs) for the previous programme or unstructured experience. In the latter case, it is 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 candidate's development while being mindful of the experience and opportunities and requirements of the new programme and plan at least the next phase of the candidate's programme.

7.6 Compulsory discipline-specific requirements to be met during the candidacy

Evidence on *broadly defined* Engineering Competency, eventually at level E, is presented in the Engineering Report Form **D2.3 ER** and associated TERs of the Application for Registration as a Professional Certificated Engineer form.

The applicable legislation and regulations require specific responsibilities to be designated to *Competent Persons.* Specific training during the candidacy period must aim to develop the applicant to achieve the competency required to accept this responsibility. In addition to assessing candidates for engineering responsibility at level E, discipline-specific requirements are assessed as well to confirm legal responsibility, also at level E (including proof of legal appointment).

While the emphasis in training applicants is on developing Engineering Competency to address *broadly defined* engineering problems and perform *broadly defined* engineering activities, the emphasis in meeting the discipline-specific requirements must be development towards accepting legal responsibility.

Applicants assisted by mentors and supervisors must during the training period ensure that they are conversant with the legal knowledge set out in **APPENDIX A** and submit evidence as such as part of the Application for Registration form. Although the focus in this form is not on *broadly defined* problems and activities as such, the integration between the legal appointment and application of engineering and management principles is important.

Applicants for Professional Certificated Engineers must submit the Discipline-specific Requirements Report (DSRR) form **R-05-DSRR-PCE**.

REVISION HISTORY

Revision Number	Revision Date	Revision Details	Approved by
Revision A	10 April 2017	Initial attempt at PCE DSTG based on R-05-ELE/MEC/MIN-PT and R-05-FPSS-SC. Needs editing from Professional Certificated Engineers.	For Approval by the PDSGC
Revision B	12 April 2017	Revisions to the Discipline-Specific Requirements Report (Form R-05-DSRR-PCE) initiated by Mr Botsane and other minor editing	Revised by the Working Group
Revision C	30 April 2017	Revisions to the entire document initiated by Mr Botsane.	Revised by the Working Group
Revision C	5 May 2017	Revisions proposed by Mr Klopper and Dr Stidworthy incorporated. Emphasis on the Outcomes, Competency Indicators, Range Statements in line with the *broadly defined* definitions confirmed. Option 2 will introduce a unique approach applicable to Professional Certificated Engineers only.	Revised by the Working Group
Revision C	3 July 2017	Approved	Approval by PDSGC
Revision C	17 August 2017	Approved	Approval by Council
Rev. 0 draft A	30 July 2021	Draft DSTG for Candidate Certificated Engineers (Factories) separated from these disciplines: R-05-MW-PCE, R-05-ME-PCE and R-05-MM-PCE	Working Group and RPS BU
Rev. 0 draft B	31 August 2021	Final Draft Reviewed	RPS BU
Rev. 0 draft C		Reviewed by Executive	RPS Executive

Revision Number	Revision Date	Revision Details	Approved by
Rev. 0 Draft D	1 September 2021	Recommendation for broader consultation	RPSC
Rev. 0 Draft E	28 October 2021	Consideration of collated inputs from broader consultation	Working Group, RPS BU
Rev. 0 Draft F	24 January 2022	Review and Recommendation for Approval	Executive RPS: EL Nxumalo
Rev. 0	09 February 2022	Approval	RPSC
Rev1	05 June 2025	The working group started with the review from Rev 0	Working Group
Rev 1	1 October 2025	The working group submitted the first draft	Working Group
Rev 1	2 October 2025	Draft submitted to Registration BU for comments	Registration BU
Rev 1	23 October 2025	Review and recommendation for Approval	Acting Executive RSIR: Ms NM Mtshali
Rev 1	05 November 2025	Approval	RPSC

The Discipline-specific Training Guide for:

Professional Certificated Engineers (Mine Managers)

Revision 1 dated 05 November 2025 and consisting of 57 pages, has been reviewed for adequacy by the Business Unit Manager and is approved by the Acting Executive: Regulatory Services & International Relations (RSIR).

.... 10 November 2025

Business Unit Administrator Date

.... 10 November 2025

Acting Executive: RSIR Date

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

APPENDIX A: TRAINING DISCIPLINE-SPECIFIC REQUIREMENTS REPORT

Form R-05-DSRR-PCE

Surname and Initials: ____

Use this form to report in about 100 words per requirement applicable, on the applicant's personal knowledge.

Attach to this report the actual applicable policies, procedures, standard forms, schedules, etc. for the Certificate selected, done by the Applicant under the supervision of an ECSA registered Professional Certificated Engineer.

Tick off (✓) the specific certificate(s) applicable to your registration application:			
1. Electrical Engineer's Certificate of Competency issued in terms of the Mines Health and Safety Act, 1996 (**R-05-MM-PCE**)		5. Manager's Certificate of Competency (Metalliferous) issued in terms of the Mines Health and Safety Act, 1996 (**R-05-MM-PCE)**	
2. Mechanical Engineer's Certificate of Competency issued in terms of the Mines Health and Safety Act, 1996 (**R-05-MM-PCE**)		6. Manager's Certificate of Competency (Coal) issued in terms of Mines Health and Safety Act, 1996 (**R-05-MM-PCE**)	
3. Electrical Engineer's Certificate of Competency issued in terms of the Occupational Health and Safety Act, 1993 (**R-05-MM-PCE**)		7. Chief Engineer Officer – Foreign Going Certificate of Competency issued in terms of the Merchant Shipping Act, 1951 (**R-05-MM-PCE**)	
4. Mechanical Engineer's Certificate of Competency issued in terms of the Occupational Health and Safety Act, 1993 (**R-05-MM-PCE**)			

REPORT:

Item	Requirements	Report
1.	Briefly set out your area of responsibility as stipulated in your letter of appointment as the responsible person.	
2.	Explain the rationale behind your appointment.	
3.	List the Acts and Regulations applicable to your specific responsibility	
4.	List your duties as a responsible engineer appointed under the regulations.	
5.	Explain the action plans that you have taken to deliver on the duties listed above.	
6.	What are the standard operating procedures applicable to your areas of responsibility, which standards/ procedures did you review and what were the recommendations?	
7.	Briefly explain the relevance of your engineering knowledge in carrying out your appointed mandate.	
8.	Describe the steps you have taken to train and develop people within your jurisdiction to adhere to the requirements of the Acts and Regulations, and what measures you took to declare people competent to perform work.	
9.	How do you deal with contraventions of the applicable Act and Regulations?	
10.	Elaborate on incident reporting and corrective measures taken to address the non-conformance.	
11.	Describe the measures you took to ensure that you did undertake your responsibility	

Item	Requirements	Report
	ethically and diligently according to your letter of appointment and the corresponding Acts and Regulations.	
12.	Explain how the engineering equipment under your control and responsibility is evaluated and handled in terms of the particular Act and Regulations.	

APPENDIX B: TRAINING ELEMENTS

Synopsis: An Applicant should achieve specific competencies at the prescribed level during his/her development towards professional registration, at the same time accepting more and more responsibility as experience is gained. The outcomes achieved and established during the candidacy phase should form the template to all engineering work performed after professional registration regardless of the level of responsibility at any particular stage of an engineering career:

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

11. Become conversant with your employer's training and development programme and develop your own lifelong development programme within this framework.

Broadly defined engineering work is usually characterised by the application of novel technology deviating from standard procedures, codes and systems, the deviation verified by research, modelling and/or substantiated design calculations.

Responsibility Levels: A = Being Exposed; B = Assisting; C = Participating; D = Contributing; E = Performing.

Competency standards for registration as a Professional Certificated Engineer	Explanation and responsibility level
1. Purpose This standard defines the competence required for registration as a Professional Certificated Engineer. Definitions of terms having particular meaning within this standard are given in text in Appendix D.	Discipline Specific Training Guides (DSTGs) give context to the purpose of the Competency Standards. Professional Certificated Engineers operate within the four disciplines recognised by ECSA. Each discipline can be further divided into sub-disciplines and finally into specific workplaces as given in Clause 4 of the specific DSTG. DSTGs are used to facilitate experiential development towards ECSA registration and assist in compiling the required portfolio of evidence (specifically the Engineering Report in the application form). **NOTE:** The training period must be utilised to develop the competence of the trainee towards achieving the standards. below at a Responsibility Level E, i.e., Performing. (Refer to 7.1 in the specific DSTG.)
2. Demonstration of competence Competence must be demonstrated within broadly 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 DSTG. **Level descriptor:** Broadly defined engineering activities (BDEAs) have several of the following characteristics:	Engineering activities can be divided into (approximately): • 5% Complex (Professional Engineers) • 5% Broadly Defined (Professional Certificated Engineers/Professional Engineering Technologists) • 10% Well-defined (Professional Certificated Engineers/Professional Engineering Technologists) • 15% Narrowly Well-defined (Registered Specified Categories) • 20% Skilled Worker (Engineering Artisan) • 55% Unskilled Worker (Artisan Assistant)

a) Scope of practice area is linked to technologies used and changes by adoption of new technology into current practice. b) Practice area is located within a wider, complex context, requires teamwork and has interfaces with other parties and disciplines. c) Involve the use of a variety resources, including people, money, equipment, materials, technologies. d) Require resolution of occasional problems arising from interactions between wide-ranging or conflicting technical, engineering or other issues. e) Are constrained by available technology, time, finance, infrastructure, resources, facilities, standards and codes, and applicable laws. f) Have significant risks and consequences in the practice area and in related areas. **Activities** include but are not limited to design; planning; investigation and problem resolution; improvement of materials, components, systems or processes; manufacture	The activities can be in-house or contracted out; evidence of integrated performance can be submitted irrespective of the situation. **Level Descriptor:** BDEAs in the various disciplines are characterised by several of or all the following: a) Scope of practice area does not cover the entire field of the discipline (exposure limited to the sub-discipline and specific workplace). Some technologies used are well established and adoption of new technologies needs investigation and evaluation. b) Practice area varies substantially with unlimited location possibilities and an additional responsibility to identify the need for advice on complex activities and problems. Broadly defined activities in the sub-discipline need interfacing with professional engineers, professional technologists, artisans, architects, financial staff, etc. as part of the team. c) The bulk of the work involves familiar, defined range of resources, including people, money, equipment, materials, but new technologies are investigated and implemented. d) Most of the impacts in the sub discipline are on wider issues, but some arise from conflicting technical and engineering issues that have to be addressed by the application of broadly defined non-standard engineering principles. e) The work packages and associated parameters are constrained by operational context with variations limited to different locations only. (Cannot be covered by standards and codes.) f) Even locally important minor risks can have far reaching consequences.

or construction; engineering operations; maintenance; project management; research; development and commercialisation.	**Activities** include but are not limited to design; planning; investigation and problem resolution; improvement of materials, components, systems or processes; engineering operations; maintenance; project management. For Certificated Engineers, research, development and commercialisation happen more frequently in some disciplines and are seldom encountered in others.

3. Outcomes to be satisfied:	Explanation and responsibility level
Group A: Engineering Problem Solving	
Outcome 1: Define, investigate and analyse *broadly defined* engineering problems.	**Responsibility Level E** Analysis of an engineering problem means the “separation into parts possibly with comment and judgement”. *Broadly* means “not minute or detailed” and “not kept within narrow limits”.
Broadly defined engineering problems have the following characteristics: a) Require coherent and detailed engineering knowledge, underpinning the technology area *and one or more of:* b) Are ill-posed, under- or over-specified, require identification and interpretation into the technology area c) Encompass systems within complex engineering systems d) Belong to families of problems that are solved in well-accepted but innovative ways *and one or more of:* e) Can be solved by structured analysis techniques	a) Coherent and detailed engineering knowledge for Certificated Engineers means the problem encountered cannot be solved without the combination of all the relevant detail including engineering principles applicable to the situation. b) The nature of the problem is not immediately obvious and further investigation to identify and interpret the real nature of the problem is necessary. c) The problem is not easily recognised as part of the larger engineering task, project or operation and may be obscured by the complexity of the larger system. d) Recognise that the problem can be classified as a falling within a typical solution requiring innovative adaptation to meet the specific situation. e) Solving the problem needs a step-by-step approach adhering to proven logic.

f) May be partially outside standards and codes; must provide justification to operate outside g) Require information from practice area and sources interfacing with practice area that is complex and incomplete h) Involve a variety of issues which may impose conflicting constraints: technical, engineering and interested or affected parties *and one or both of:* i) Require judgement in decision-making in practice area, considering interfaces to other areas j) Have significant consequences which are important in practice area but may extend more widely.	f) The standards, codes and documented procedures must be analysed to determine to what extent they are applicable to solve the problem and justification must be given to operate outside these. g) The responsibility lies with the Certificated Engineer to verify that some information received as part of the problem encountered may remain incomplete and solutions to problems may need justified assumptions. h) The problem handled by a Certificated Engineer may be solved by alternatives that are unaffordable, detrimental to the environment, socially unacceptable, not maintainable, not sustainable, etc.; the Technologist will have to justify his / her recommendation. i) Practical solutions to problems include knowledge and judgement of the roles displayed by the multi-disciplinary team and impact of own work in the interactive environment. j) Certificated Engineers must realize that their actions might seem to be of local importance only but may develop into significant consequences extending beyond their ability and practice area.
Assessment criteria: A structured analysis of broadly defined problems typified by the following performances is expected: 1.1 Performed in or contributed to defining engineering problems leading to an agreed definition of the problems to be solved.	To perform an engineering task, a Certificated Engineer will typically receive an instruction from a senior person (customer) to do a specific task, and must: 1.1 make sure that the instruction is complete, clear and within his/her capability and that the person who issued the instruction agrees with his/her interpretation 1.2 segregate the engineering problem and related information from the bulk of the information investigated and evaluated

1.2 Performed in or contributed to investigating engineering problems including collecting, organising and evaluating information. 1.3 Performed in or contributed to analysis of engineering problems using conceptualisation, justified assumptions, limitations and evaluation of results.	1.3 ensure that the instruction and information to do the work is fully understood and complete, including engineering theory needed to understand the task and acceptance criteria, and to carry out and/or check calculations; if needed supplementary information must be gathered, studied and understood; concepts and assumptions must be justified by engineering theory and calculations, if applicable.
Range Statement: The problem may be a design requirement, an applied Research and Development requirement or a problematic situation in an existing component, system or process. The problem is one amenable to solution by technologies known to the candidate. This outcome is concerned with the understanding of a problem: Outcome 2 is concerned with the solution.	Please refer to clause 4 of the specific DSTG.
Outcome 2: Design or develop solutions to broadly defined engineering problems	**Responsibility Level E** Design means “drawing or outline from which something can be made”. Develop means “come or bring into a state in which it is active or visible”.
Assessment criteria: This outcome is normally demonstrated after a problem analysis as defined in outcome 1. Working systematically to synthesise a solution to	

a broadly defined problem, typified by the following performances is expected: 2.1 Designed or developed solutions to broadly defined engineering problems. 2.2 Systematically synthesised solutions and alternative solutions or approaches to the problem by analysing designs against requirements, including costs and impacts on outside parameters. (Requirements.) 2.3 Drawing up of detailed specification requirements and design documentation for implementation to the satisfaction of the client.	After the task received is fully understood and interpreted, a solution to the problem posed can be developed (designed). To synthesise a solution means "the combination of separate parts, elements, substances, etc. into a whole or into a system" by the following: 2.1 The development (design) of more than one way to solve an engineering task or problem should always be done including the costing and impact assessment for each alternative. All the alternatives must meet the requirements set out by the instruction received, and the theoretical calculations to support each alternative must be done and submitted as an attachment. 2.2 The Certificated Engineer will in some cases be unable to support proposals with the complete theoretical calculation to substantiate every aspect and must in these cases refer his/her alternatives to an Engineer for scrutiny and support. The alternatives and alternative recommended must be convincingly detailed to win customer support for the alternative recommended. Selection of alternatives might be based on tenders submitted with alternatives deviating from those specified. 2.3 The best complete and final solution selected must be followed up with a detailed technical specification, supporting drawings, bill of quantities, etc., for the execution of work to meet customer requirements.
Range Statement: Solutions are those enabled by the technologies in the Candidate's practice area.	Applying theory to do broadly defined engineering work is mostly done in a way that has been used before, probably developed by engineers in the past and documented in written procedures, specifications, drawings, models, examples, etc. Certificated Engineers must

	seek approval of any deviation from these established methods, but also initiate and/or participate in the development and revision of these norms.
Outcome 3: Comprehend and apply the knowledge embodied in widely accepted and applied engineering procedures, processes, systems or methodologies and those specific to the jurisdiction in which he/she practices.	**Responsibility level E** Comprehend means "to understand fully". The jurisdiction in which a Certificated Engineer practices is given in clause 4 of the specific **DSTG**.
Assessment criteria: This outcome is normally demonstrated in the course of design, investigation or operations. 3.1 Applied engineering principles, practices, technologies, including the application of BTech theory in the practice area. 3.2 Indicated working knowledge of areas of practice that interact with practice area to underpin teamwork. 3.3 Applied related knowledge of finance, statutory, safety and management.	Design work for Certificated Engineers is based on BSc, BEng, BTech or ND theory and is mostly the utilisation and configuration of manufactured components and selected materials and associated novel technology. Certificated Engineers develop and apply codes and procedures in their design work. Investigation would be on broadly defined be incidents and condition monitoring, and operations mostly on developing and improving engineering systems and operations. 3.1 Calculations at BSc, BEng, BTech or ND theoretical level confirming the correct application and utilisation of equipment, materials and systems listed in Clause 4 of the specific DSTG must be done on broadly defined activities. 3.2 The understanding of broadly defined procedures and techniques must be based on fundamental mathematical, scientific and engineering knowledge, as part of personal contribution within the engineering team. 3.3 The ability to manage the resources within legal and financial constraints must be evident.

Range statement: Applicable knowledge includes the following: a) Technological knowledge that is well-established and applicable to the practice area irrespective of location, supplemented by locally relevant knowledge, for example, established properties of local materials. Emerging technologies are adopted from formulations of others. b) A working knowledge of interacting disciplines (engineering and other) to underpin teamwork. c) Jurisdictional knowledge includes legal and regulatory requirements as well as locally relevant codes of practice. As required for practice area, a selection of law of contract, health and safety, environmental, intellectual property, contract administration, quality management, risk management, maintenance management, regulation, project and construction management.	a) The specific location of a task to be executed is the most important determining factor in the layout design and utilisation of equipment. A combination of educational knowledge and practical experience must be used to substantiate decisions taken including a comprehensive study of systems, materials, components and projected customer requirements and expectations. New ideas, materials, components and systems must be investigated, evaluated and applied accompanied by complex theoretical motivation. b) In spite of having a working knowledge of interacting disciplines, Certificated Engineers take responsibility for the multidisciplinary team of specialists like Civil Engineers on structures and roads, Mechanical Engineers on fire protection equipment, Architects on buildings, Electrical Engineers on communication equipment, etc. c) Jurisdictional in this instance means "having the authority", and Certificated Engineers must be aware of and decide on the relevant requirements applicable to each specific project that he/she is responsible for. They are usually appointed as the "responsible person" for specific projects or as "competent person" for compliancy with Occupational Health and Safety Act.
Group B: Managing Engineering Activities	**Explanation and Responsibility Level**
Outcome 4: Manage part or all of one or more broadly defined engineering activities.	**Responsibility Level E** Manage means "control".

Assessment criteria: The candidate is expected to display personal and work process management abilities: 4.1 Managed self, people, work priorities, processes and resources in broadly defined engineering work. 4.2 Role in planning, organising, leading and controlling broadly defined engineering activities evident. 4.3 Knowledge of conditions and operation of contractors and the ability to establish and maintain professional and business relationships evident.	In engineering operations, Certificated Engineers will typically be given the responsibility to carry out projects. 4.1 Resources are usually subdivided based on availability and controlled by a work breakdown structure and scheduling to meet deadlines. Quality, safety and environment management are important aspects. 4.2 The basic elements of management must be applied to broadly defined engineering work. 4.3 Depending on the project, Certificated Engineers can be the team leader, a team member or can supervise appointed contractors. To achieve this, maintenance of relationships is important and must be demonstrated.
Outcome 5: Communicate clearly with others in the course of his or her broadly defined engineering activities	**Responsibility Level E**
Assessment criteria: Demonstrates effective communication by: 5.1 ability to write clear, concise, effective technical, legal and editorially correct reports shown 5.2 ability to issue clear instructions to stakeholders using appropriate language and communication skills evident	5.1 Refer to Range Statement for Outcome 4 and 5 below. 5.2 Refer to Range Statement for Outcome 4 and 5 below.

5.3 oral presentations made using structure, style, language, visual aids and supporting documents appropriate to the audience and purpose.	5.3 Presentation of point of view mostly occurs in meetings and discussions with immediate supervisor.
Range statement for Outcomes 4 and 5: Management and communication in well-defined engineering involves: a) Planning broadly defined activities b) Organising broadly defined activities c) Leading broadly defined activities d) Controlling broadly defined activities.	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; influence; persuade”. d) Controlling means the “means of regulating, restraining, keeping in order; check”. Certificated Engineers write specifications for the purchase of materials and/or work to be done, recommendations on tenders received, place orders and variation orders, write work instructions, report on work done, draw, correct and revise drawings, compile test reports, use operation and maintenance manuals to write work procedures, write inspection and audit reports, write commissioning reports, prepare and present motivations for new projects, compile budget reports, 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 on cost control, etc.
Group C: Impacts of Engineering Activity	**Explanation and Responsibility Level**

Outcome 6: Recognise the foreseeable social, cultural and environmental effects of broadly defined engineering activities generally.	**Responsibility level E** 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".
Assessment criteria: This outcome is normally displayed in the course of analysis and solution of problems. The Candidate typically: 6.1 has the ability to identify interested and affected parties and their expectations in regard to interactions between technical, social, cultural and environmental considerations shown; 6.2 takes measures taken to mitigate the negative effects of engineering activities evident.	6.1 Engineering impacts heavily on 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 wildlife, dangerous rotating and other machines, demolishing structures, etc. 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, compensation paid, etc.

Outcome 7: Meet all legal and regulatory requirements and protect the health and safety of persons in the course of his or her broadly defined engineering activities.	**Responsibility Level E**
Assessment criteria: 7.1 Identified applicable legal and regulatory requirements including health and safety requirements for the engineering activity. 7.2 Circumstances stated where the applicant assisted in or demonstrated awareness of the selection of safe and sustainable materials, components and systems, and identified risk and applied risk management strategies.	7.1 The Occupational Health and Safety Act supersedes any act, regulation, local authority by-laws, standards and codes of practice. Places of work might have standard procedures, instructions, drawings and operation and maintenance manuals available. These documents, depending on the situation (emergency, breakdown, etc.) are consulted before work is commenced and during the activity. 7.2 It is essential to attend a Risk Management (Assessment) course, and to investigate and study the materials, components and systems used in the workplace. The Certificated Engineer seeks advice from knowledgeable and experienced specialists if the slightest doubt exists that safety and sustainability cannot be guaranteed.
Range statement for Outcomes 6 and 7: Impacts and regulatory requirements include: a) both explicit regulated factors and those that arise in the course of particular work	a) 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 construction in a rural area. The methods, techniques or procedures will differ accordingly and may be complex and are identified and studied by the Certificated Engineer before starting the work.

b) impacts considered extend over the lifecycle of the project and include the consequences of the technologies applied	b) The Competent/Responsible Person appointed in accordance with the OHS Act usually confirms or checks that the instructions are in line with regulations. The Certificated Engineer is responsible to see that this is done, and if not, he/she establishes which regulations apply and ensures that they are adhered to. Usually, the people working on site are strictly controlled w.r.t. health and safety, but the Certificated Engineer checks that this is done, but may authorise unavoidable deviation after setting conditions for such deviations. Projects are mostly carried out where contact with the public cannot be avoided and safety measures like barricading and warning signs must be used and maintained.
c) effects to be considered include direct and indirect, immediate and long-term related to the technology used	c) Effects associated with risk management are mostly well known if not obvious, and methods used to address, clearly defined. Risks are mostly associated with elevated structures, subsidence of soil, electrocution of people and moving parts on machinery. The Certificated Engineer needs to identify, analyse and manage any long-term risks, and develop strategies to solve these by using alternative technologies.
d) safe and sustainable materials, components and systems	d) The safe and sustainable materials, components and systems must be selected and prescribed by the Certificated Engineers, or other professional specialists must be consulted. It is the Certificated Engineer's responsibility to use his/her knowledge and experience to confirm that prescriptions by others are correct and safe.
e) regulatory requirements that are explicit for the context in general.	e) Application of regulations associated with the particular aspects of the project must be carefully identified and controlled by the Certificated Engineer.

Group D: Exercise judgment, take responsibility, and act ethically	Explanation and Responsibility Level
Outcome 8: Conduct engineering activities ethically.	**Responsibility level E** Ethically means “science of morals; moral soundness”. Moral means “moral habits; standards of behaviour; principles of right and wrong”.
Assessment criteria: Sensitivity to ethical issues and the adoption of a systematic approach to resolving these issues is expected, typified by: 8.1 conversance and operation in compliance with ECSA’s Rules of Conduct for registered persons confirmed 8.2 how ethical problems and affected parties were identified, and the best solution to resolve the problem selected.	Systematic means “methodical; based on a system”. 8.1 ECSA’s Code of Conduct, as per ECSA’s website, is known and adhered to. 8.2 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, misrepresentation of facts, etc.
Outcome 9: Exercise sound judgement in the course of broadly defined engineering activities.	**Responsibility Level E** Judgement means “good sense: ability to judge”.
Assessment criteria: Judgement is displayed by the following performance:	9.1 The extent of a project given to a junior Certificated Engineer is characterised by several broadly defined and a few well-defined factors and their resulting

9.1 Judgement exercised in arriving at a conclusion within the application of technologies and their interrelationship to other disciplines and technologies. 9.2 Factors taken into consideration given, bearing in mind, risk, consequences in technology application and affected parties.	interdependence. He/she will seek advice if educational and/or experiential limitations are exceeded. 9.2 Taking risky decisions will lead to equipment failure, excessive installation and maintenance cost, damage to persons and property, etc. Evaluation includes engineering calculations to substantiate decisions taken, and assumptions made.
Range statement for Outcomes 8 and 9: Judgement in decision-making involves: a) taking several risk factors into account; or b) significant consequences in technology application and related contexts; or c) ranges of interested and affected parties with widely varying needs.	In Engineering about 5% of engineering activities can be classified as broadly defined where the Certificated Engineer uses standard procedures, codes of practice, specifications, etc., but develops variations and completely unique standards when needed. Judgement must be displayed to identify any activity falling inside the broadly defined range, as defined above by the following: a) Getting the work done in spite of numerous risk factors needs good judgement and substantiated decision-making. b) Consequences are part of the project, e.g., extra cost due to unforeseen conditions, incompetent contractors, long term environmental damage, etc. c) Interested and affected parties with defined needs that may be in conflict, e.g., need for a service irrespective of environmental damage, local traditions and preferences, etc. needs sound management and judgement.

Outcome 10: Be responsible for making decisions on part or all of all of one or more broadly defined engineering activities.	**Responsibility level E** Responsible means "legally or morally liable for carrying out a duty; for the care of something or somebody in a position where one may be blamed for loss, failure, etc.".
Assessment criteria: Responsibility is displayed by the following performance: 10.1 Engineering, social, environment and sustainable development taken into consideration in discharging responsibilities for significant parts of one or more activities. 10.2 Advice sought from a responsible authority on matters outside area of competence. 10.3 Academic knowledge of at least BTech level combined with past experience used in formulating decisions 10.4 Proof of appointment as competent person in terms of GMR 2.1 or GMR 2.7 in a workplace, or proof of an appointment as an inspector under the OHSA to administer the Act and regulations through inspections and investigations	10.1 All interrelated factors taken into consideration are indicative of professional responsibility accepted working on broadly defined activities. 10.2 The Certificated Engineer does not operate on tasks at a higher level than broadly defined and consults professionals at engineer level if elements of the project to be done are beyond his/her education and experience, e.g., power system stability. 10.3 This is 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 an important element. The calculations, for example fault levels, load calculations, losses, etc. are done to ensure that the correct material and components are utilised.

Range statement: Responsibility must be discharged for significant parts of one or more broadly defined engineering activities.	The responsibility is mostly allocated within a team environment with an increasing designation as experience is gathered.
Note 1: Demonstrating responsibility would be under supervision of a competent engineering practitioner but he/she is expected to perform as if in a responsible position.	
Group E: Initial Professional Development (IPD)	**Explanation and Responsibility Level**
Outcome 11: Undertake independent learning activities sufficient to maintain and extend his or her competence.	**Responsibility Level E**
Assessment criteria: Self-development managed typically: 11.1 Strategy independently adopted to enhance professional development evident. 11.2 Awareness of philosophy of employer in regard to professional development evident.	11.1 If possible, a specific field of the sub-discipline is chosen, available developmental alternatives established, a programme drawn up (in consultation with employer if costs are involved), and options open to expand knowledge into additional fields investigated. 11.2 Record keeping must not be left to the employer or anybody else. The trainee must manage his/her own training independently, taking initiative and be in charge of experiential development towards Professional Certificated Engineer level.
Range statement: Professional development involves: a) planning own professional development strategy	a) In most places of work training is seldom organised by some training department. It is up to the Certificated Engineer to manage his/her own experiential development.

b) selecting appropriate professional development activities c) recording professional development strategy and activities, while displaying independent learning ability.	Certificated Engineers frequently end up in a 'dead-end street' being left behind doing repetitive work. If self-development is not driven by him/herself, success is unlikely. b) Preference must be given to engineering development rather than developing soft skills. c) Developing a learning culture in the workplace environment of the Certificated Engineer is vital to his / her success. Information is readily available, and most senior personnel in the workplace are willing to mentor, if approached.