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SOUTH AFRICA

Discipline-specific Training Guide for Registration as a Professional Engineer in Mining Engineering

R-05-MIN-PE

REVISION 3: 31 August 2022

ENGINEERING COUNCIL OF SOUTH AFRICA
Tel: 011 607 9500 | Fax: 011 622 9295
Email: engineer@ecsa.co.za | Website: www.ecsa.co.za

ECSA

TABLE OF CONTENTS

DEFINITIONS

Broadly defined engineering work is characterised by the following:

(a) It is constrained by available technology, time, finance, infrastructure, resources, facilities, applicable laws, standards and codes.

(b) It involves a variety of resources, including people, money, equipment, materials and technologies.

(c) It requires the resolution of occasional problems arising from interactions among wide-ranging or conflicting issues such as technical and engineering issues.

(d) It has significant risks and consequences in the practice area and related areas.

(e) The practice area is located within a wider, complex context; it requires teamwork and has interfaces with other parties and disciplines.

(f) The scope of the practice area is linked to the technologies used and the changes due to the adoption of new technology into current practice.

Candidate means a person who is registered with the ECSA in a Candidate category of registration.

Competence/Competency is defined in document **R-02-STA-PE/PT/PN – Competency Standard for Registration in Professional Categories as PE/PT/PN**

Competency standard means a statement of competency required for a defined purpose.

Complex engineering activities have several of the following characteristics:

(a) The scope of activities may encompass entire complex engineering systems or complex subsystems and may extend beyond previous experiences, i.e., unfamiliar scenarios.

(b) The context of the activity is complex and requires identification and specification.

(c) It requires diverse and significant resources, including people and money.

(d) It involves multiple facets such as equipment, materials and technology.

(e) It encompasses significant and complex interactions between wide-ranging or conflicting technical, engineering and other issues.

(f) It has constraints and challenges with respect to time, finance, infrastructure, resources, facilities, applicable laws, standards and codes.

(g) It involves significant risks and consequences in a range of contexts, requiring responsibility and accountability in decision-making and judgement.

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

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

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

Management of engineering works or activities means the required coordination of activities to:

(a) direct and control engineering processes and systems, including commissioning and operation and decommissioning of equipment

(b) direct and control everything that is constructed or results from construction or manufacturing operations

(c) maintain engineering works and equipment in a state in which they can perform their required function.

(d) operate engineering works safely and in the manner intended

(e) return engineering works, plant and equipment in an acceptable condition through the renewal, replacement or repair of worn, damaged or decayed parts.

Mentor means a professionally registered person who guides the competency development of a Candidate in an appropriate category.

Mine Operations means:

(a) the removal of economically beneficial minerals from the natural deposits or from waste or stockpiles by any surface or underground mining methods

(b) operations or activities conducted underground or on the surface associated with or incident to the preparation, development, operation, maintenance, opening and reopening of an underground or surface mine storage or stockpiling of mined materials, backfilling, sealing and other closure procedures related to a mine or the movement, assembly, disassembly or staging of any mining equipment

(c) milling

(d) ore preparation, ore processing or testing

(e) refuse disposal, fines disposal or the operation and maintenance of impoundments

(f) the operation of any mine drainage system

(g) reclamation activities and operations; or

(h) the operation of ports, terminals, river or rail load-outs or any other transportation facilities.

Mine Planning and Design means the design and production scheduling of mining operations to optimise the return (of profit) on investment through capital investment (typically in mobile equipment), design, extraction scheduling and preparation of the mineral product according to specifications. The three main elements of mine planning would typically include long-term, medium-term and short-term planning. Inputs into the mine planning process could include, but are not limited to geological model, geotechnical model, mining method and layouts, metallurgical model, extraction strategy, loss and dilution factors, cost of mining/processing, and commodity value.

Mineral Asset Valuation means the valuation of a mineral asset that has been completed in accordance with an appropriate mineral asset valuation code, such as the SAMVAL Code, and signed off by a competent valuator. The valuation of a mineral asset determines its monetary worth in the marketplace.

Occupational Health, Safety and Environmental Engineering means the discipline of mining engineering related activities specialising in the safety, health and welfare of people engaged in work

or employment in the mining industry. The goals of occupational health, safety and environmental programmes include fostering a safe and healthy work environment (where environmental engineering may include but is not limited to mine ventilation, mine refrigeration, mine safety and mine occupational health).

Outcome at the professional level means a statement regarding 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 through following the path of education, training and experience.

Research and Development means the practice of mining engineering activities whereby new technologies, systems and/or service can be applied to the mining industry, such that:

(a) Current Operation – To increase the efficiency of extraction and improvement in occupational health and safety and reduction in costs

(b) Mechanised mining – To develop fully mechanised mining systems that will allow for the drilling of narrow hard rock mines

(c) Non-explosive rock breaking – To develop extraction mining systems completely independent of the use of explosives.

Rock Engineering means the discipline of designing and supporting stable excavations in rock, either on surface or underground. By understanding the properties of the rock quantitatively as well as qualitatively, the design of stable excavations in mines is made possible.

Specified category means a category of registration for persons who are licensed through the Engineering Profession Act, 46 of 2000 or a combination of external legislation and the Engineering Profession Act and who have specific engineering competencies at the level of NQF 5 that are associated with an identified need to protect the public safety, health and interest or the environment in relation to an engineering activity.

Supervisor means a person who oversees and controls engineering work performed by a Candidate.

Voluntary Association means an entity found in common law and is ordinarily used for the achievement of a common goal between its members. Examples of voluntary associations in the mining industry include South Africa Institute for Mining and Metallurgy (SAIMM), South African National Institute of Rock Engineering (SANIRE), Association of Mine Managers of South Africa (AMMSA) etc.

Please note *that these definitions are not exhaustive with regards to mining engineering related jargon and terminology, but these few definitions have been specifically referenced in this document.*

ABBREVIATIONS

ASTM	American Society for Testing and Materials
C&U	Commitment and undertaking
CPD	Continuing Professional Development
DoR	Degree of Responsibility
DSTG	Discipline-specific Training Guide
ECSA	Engineering Council of South Africa
HIRA	Hazard Identification and Risk Assessment
HAZOP	Hazard and Operability Analysis
IPD	Initial Professional Development
MHS	Mine Health and Safety
NQF	National Qualifications Framework
OFO	Organising Framework for Occupations
OHS	Occupational Health and Safety
PDP	Professional Development Programme
PE	Professional Engineer
TES	Training and Experience Summary
TERs	Training and Experience Reports
JORC*	Joint Ore Reserves Committee; Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves
VALMIN*	Australasian Code for the Technical Assessment and Valuation of Mineral and Petroleum Assets and Securities for Independent Expert Reports
SAMREC*	The South African Code for the Reporting of Exploration Results, Mineral Resources and Mineral Reserves
SAMVAL*	The South African Code for the Reporting of Mineral Asset Valuation

NI43-101*	A national instrument for the Standards of Disclosure for Mineral Projects within Canada
CIMVAL*	Canadian Standards and Guidelines for the Valuation of Mineral Properties
IMVAL*	The International Mineral Property Valuation Standards

Please note *that these abbreviations are not exhaustive with regards to mining engineering related jargon and terminology, but these few definitions have been specifically referenced in this document.*

** Please refer to the specific and recognised codes for further definitions and terminology.*

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.

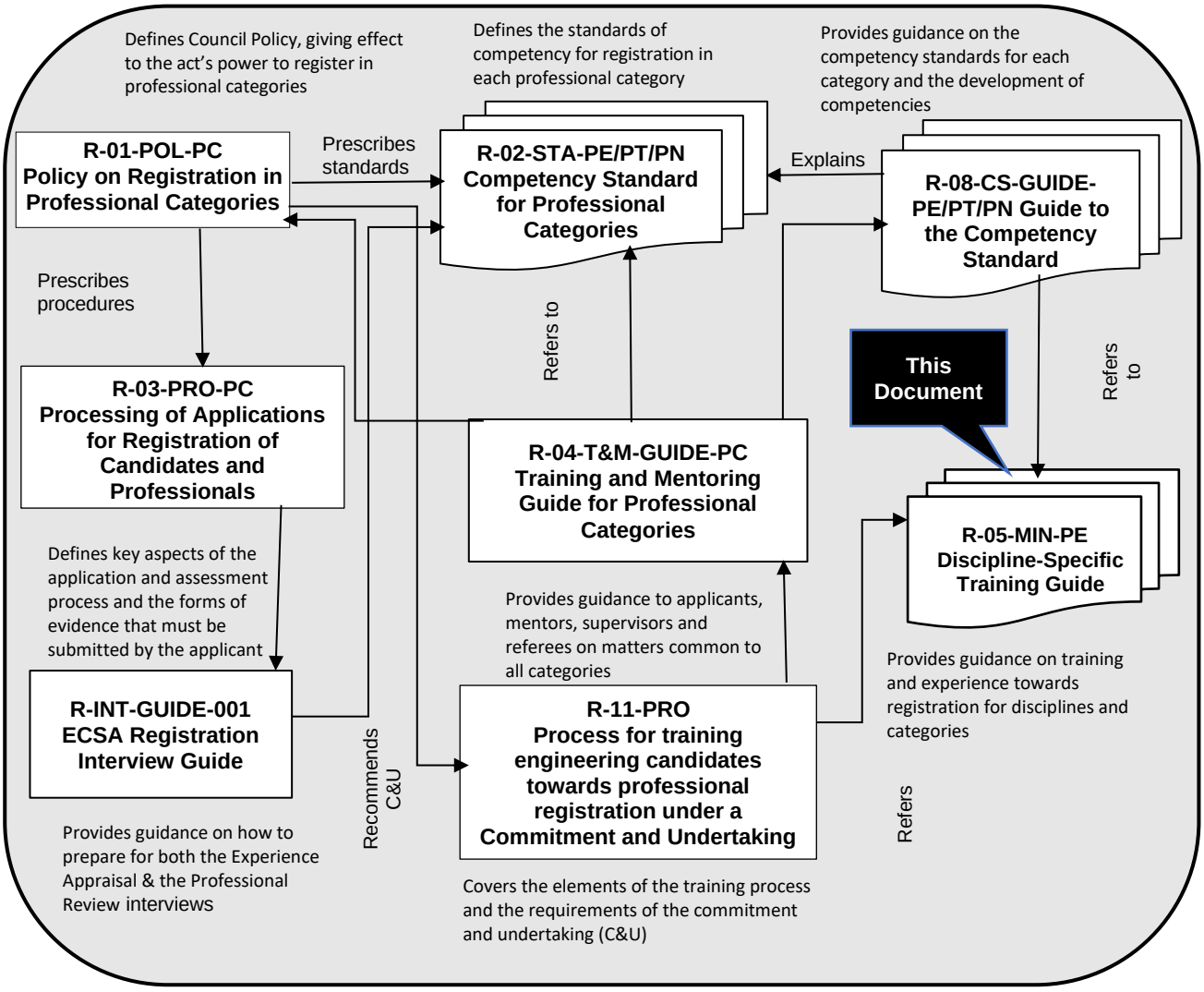


Figure 1: Documents defining the ECSA registration system

1. PURPOSE OF THIS DOCUMENT

All persons applying for registration as Professional Engineers are expected to demonstrate the competencies specified in document **R-02-STA-PE/PT/PN** through work performed at the prescribed level of responsibility, irrespective of the trainee's discipline.

This document supplements the generic *Training and Mentoring Guide* (document **R-04-T&M-GUIDE-PC**) and the G*uide to the Competency Standards for Professional Engineers* (document **R-08-CS-GUIDE-PE/PT/PN**). In document **R-04-T&M-GUIDE-PC**, attention is drawn to the following sections:

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

The second document (document **R-08-CS-GUIDE-PE/PT/PN**) provides a high-level, outcome-by-outcome understanding of the competency standards that form an essential basis for this Discipline-specific Training Guide (DSTG).

This guide and the documents **R-04-T&M-GUIDE-PC** and **R-08-CS-GUIDE-PE/PT/PN** are subordinate to the *Policy on Registration* (document **R-01-POL-PC**), the *Competency Standard* (document **R-02-STA-PE/PT/PN**) and the application process definition (document **R-03-PRO-PC**).

2. AUDIENCE

This DSTG is directed towards Candidates and their supervisors and mentors in the discipline of Mining Engineering. It is also applicable to engineers who have studied in related sub-disciplines or practice areas but whose engineering work is primarily that of Mining Engineering and who wish to be assessed for professional registration based on their work/experience in the Mining Engineering environment. The guide is intended to support a programme of training and experience through incorporating good practice elements.

This guide applies to persons who have

- completed the tertiary educational requirements in Mining Engineering
    - by obtaining an accredited BEng type qualification from a recognised tertiary university in South Africa or by a combination of qualifications in pathways recognised in document **E-23-P**
    - by obtaining a Washington Accord recognised qualification, or
    - through evaluation/assessment and judged to be substantially equivalent to a Washington Accord recognised qualification
- registered with the ECSA as a Candidate Engineer; and/or
- embarked on a process of acceptable training under a registered Commitment and Undertaking (C&U) programme under the supervision of an assigned mentor guiding the professional development process at each stage.

3. PERSONS NOT REGISTERED AS A CANDIDATE AND/OR NOT TRAINED UNDER A C&U

Irrespective of the development path followed, all applicants for registration must present the same evidence of competence and be assessed against the same standards. Application for registration as a Professional Engineer is permitted without being registered as a Candidate Engineer and without training under C&U. Mentorship and adequate supervision are, however, key factors in effective development to the level required for registration.

If the trainee's employer does not offer a 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 Voluntary Association for the discipline may be consulted for assistance in locating an external mentor. A mentor should keep abreast of all stages of the development process.

This guide is written for the recent graduate who is training and gaining experience towards registration. Mature applicants for registration may apply the guide 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.

4. ORGANISING FRAMEWORK FOR OCCUPATIONS

Mining Engineering (Organising Framework for Occupations)

The Mining Engineer applies engineering principles to the discovery, evaluation, planning, development, operation, closure and reclamation of mines in a safe, sustainable, profitable and socially acceptable way.

4.1 Typical tasks performed by a Mining Engineer

Tasks performed by a Mining Engineer include one or more of the following:

- All levels of feasibility studies (such as concept, pre-feasibility, bankable and definitive feasibility studies), life-of-mine extraction strategies and business plans based on best practice standards for mining ventures.
- Design, planning and scheduling of mines for the extraction of metals and minerals, including technical and infrastructure support services, occupational health and safety requirements and environmental considerations.
- Establishment and operation of mines with due regard to legislation, operation controls and standards, occupational health and safety, and site-specific and socio-political requirements.
- Fundamental and operational research to identify new technologies, mining methods and systems and operating systems to improve safety and health, productivity, sustainability and social responsibility.
- Education and training of future Mining Engineers.

4.2 Typical practice areas for Mining Engineers

Mining Engineers generally concentrate on one or more of the following practice areas:

- Operation of mines
- Rock Engineering and strata control
- Occupational health and safety and environmental engineering
- Mine planning and design
- Mineral asset valuation
- Education and training of Mining Engineers
- Consultancy work.

4.2.1 Mining Engineering: Mine operations

In mine operations, the Mining Engineer has, where necessary, legal and core mining engineering qualifications and is assisted by interdisciplinary specialists. However, the Mining Engineer must demonstrate competency in:

- mine design, production, planning and scheduling
- resource planning, utilisation and optimisation
- mine logistics, ore clearance and infrastructure services
- mine technical services, including geology, mineral evaluation, ventilation engineering, rock engineering, occupational health and safety and environmental engineering
- sustainable development regarding energy conservation, climate change, air pollution, water usage, pollution and conservation, biodiversity and waste and hazardous substance management
- enterprise risk management
- social responsibility
- operations research and development
- project execution and management.

4.2.2 Rock Engineering

In the field of Rock Engineering, the Mining Engineer must demonstrate competence in:

- the basic mining process, including mine design, programming and scheduling and occupational health and safety
- rock engineering designs and specifications applicable to mine layouts and mining methods, including stability of mine excavations, support design and installation, rock dumps and other mining related geotechnical considerations
- rock engineering hazards, risk identification and amelioration
- support and training of subordinates and mine production personnel in the rock engineering aspects of safe mining
- project design and execution principles;
- laboratory testing (ASTM standards pertaining to soil and rock testing, for example)
- research and development.

4.2.3 Occupational Health, Safety and Environmental Engineering

In the field of Occupational Health, Safety and Environmental Engineering, the Mining Engineer must demonstrate competence in:

- the basic mining process, including mine design, programming, scheduling and occupational health and safety
- mine ventilation and climate-control designs and specifications applicable to mine layouts and mining methods, including fan and refrigeration plant design and installation, ventilation controls, mine cooling and the removal of gases, fumes and dust
- routine monitoring of air quality and quantity and occupational hygiene measurements
- ventilation engineering, occupational health hazards, risk identification and amelioration
- design and maintenance of emergency procedures
- project design and execution principles
- research and development.

4.2.4 Mine planning and design

In the field of mine planning and design, the Mining Engineer must demonstrate competence in:

- the engineering criteria of mine design, including criteria relating to geology, Rock Engineering, ventilation and occupational health and safety
- design and planning of mines and mine layouts and the impacts on production levels in addition to Rock and Ventilation Engineering requirements, logistics, ore clearance, mine services, equipment requirements and productivity
- understanding various mine design and software packages
- mineral resource management, including the conversion of mineral resources to mineral reserves, such as is described in various applicable mineral resource and reserve estimation codes such as SAMREC, JORC and NI43-101, as examples
- life of mine: long- and short-term production forecasting
- mine business cycles, including the strategic and the tactical mine design and planning process
- mining value chain, business optimisation and value engineering
- design, planning and scheduling, risk identification and amelioration
- project design and execution principles.

4.2.5 Mineral asset valuation

In the field of mineral asset evaluation, the Mining Engineer must demonstrate competence in:

- the basic mining process, including mine design, programming, scheduling and occupational health and safety
- appreciation of geological evaluation techniques and models and interpretation of mine planning outcomes
- determination and classification of mineral resources and reserves, such as is described in various applicable mineral resource and reserve estimation codes such as SAMREC, JORC and NI43-101, as examples
- mine economics in regard to commodity prices, capital and operating cost, cash flow, return on investment and business modelling
- technical and financial risk assessment on project and operations

- project design and execution principles
- determining mineral asset value through the various valuation approaches described in the various mineral asset valuation codes such SAMVAL, VALMIN, CIMVAL and IMVAL, as examples.

4.2.6 Research and development

In the field of research and development, the Mining Engineer must demonstrate competence in the use of mining engineering knowledge to:

- improve mining safety and health performance
- improve operational efficiency and productivity
- solve complex mine design, rock engineering and mine ventilation problems
- develop and/or apply new technologies for mining methods, layouts and machinery; and
- modernise and automate mines and mining methods.

4.2.7 Education and training

In the field of education and training, the Mining Engineer must demonstrate competence in:

- training undergraduate and postgraduate Mining Engineering students
- performing the duties of a supervisor as set out in document **R-04-T&M-GUIDE-PC**
- performing the duties of a mentor as set out in document **R-04-T&M-GUIDE-PC**.

4.2.8 Consulting/Consultancy Work

Professional Mining Engineers whose education, experience and training qualifies them to be a specialist in a unique competency may provide consulting services in one or more of the practice areas set out above.

5. NATURE AND ORGANISATION OF THE INDUSTRY

Mining Engineers may be employed in either the private or the public sector.

In the private sector, Mining Engineers are typically involved in mining production, consulting and contracting in supply and manufacturing organisations. Mining engineering consultants are responsible for planning, designing, documenting and overseeing the construction of projects on behalf of their clients. Mining engineering contractors are responsible for project implementation, and their activities include planning, construction and labour and resource management. Mining Engineers working in supply and manufacturing companies are involved in production, supply and quality control of equipment and machinery and could be involved in research and development. An extension of the public sector includes tertiary academic institutions and research organisations.

Depending on where the Candidate is employed, in-house opportunities may not be sufficiently diverse to develop all the required competencies noted in groups A and B in document **R-02-STA-PE/PT/PN**. For example, the opportunities for developing problem-solving competence (including design and development of solutions) and for managing engineering activities may not be available to Candidates through their direct employers. In such cases, employers are encouraged to implement a secondment system.

It is fairly common practice that for situations in which organisations are unable to provide training in certain areas, secondments are arranged with other organisations so that Candidates are able to develop all the competencies required for registration. Such secondments are usually reciprocal in nature so that both employers and their respective employees mutually benefit from the other party. Secondments between consultants and contractors and between the public and the private sectors should be possible.

Problem-solving in the environments of design, operation, construction and research is the Mining Engineer's core competence. It is a logical thinking process that requires engineers to apply their minds diligently in bringing solutions to technically complex problems. This process involves analysing systems and integrating various elements of Mining Engineering through the application of basic and engineering sciences.

5.1 Diversity of mining

Owing to the diversity in the application of Mining Engineering within the South African mining industry, Mining Engineers can follow various routes to registration across multiple minerals/commodities (e.g., precious metals, precious stones, ferrous metals, base metals, industrial minerals and coal) in differing mining-method environments (e.g., surface mining, quarrying, narrow tabular ore body underground mining, massive ore body underground mining and underground coal mining).

After graduation as a Candidate Mining Engineer, these routes to registration usually cover a period of operational experience that leads to specialisation in a particular field or sector of the South African mining industry. Typically, these fields include mining operations, mine planning and design, rock engineering/strata control, ventilation and occupational health, safety and environmental engineering, refrigeration engineering, techno-economic evaluation, equipment selection, establishment and maintenance of mining infrastructure, provision of mining consulting services, and education and training of engineers-in-training.

Each field has been covered above, but all the supplementary elements may not have been mentioned after each heading. The objective is that the Mining Engineer becomes a well-rounded engineer.

6. DEVELOPING COMPETENCY: (DOCUMENT R-08-CS-GUIDE-PE/PT/PN)

6.1 Contextual knowledge

Applicants are expected to be aware of the requirements of the engineering profession, the Voluntary Associations applicable to Mining Engineers and the functions and services that these associations render to members.

6.2 Functions performed

Special consideration in the discipline, sub-discipline or specialty must be given to the competencies specified in the following groups:

- Knowledge-based problem-solving (this should be a strong focus)

- Management and communication
- Identifying and mitigating the impacts of engineering activity
- Judgement and responsibility
- Independent learning.

It is useful to measure the progression of the applicant's competency using the scales for Degree of Responsibility (DoR) in document **R-04-T&M-GUIDE-PC**, Problem Solving and Engineering Activity as specified in the relevant documentation.

Appendix 1 on professional development programmes (PDP) has been developed against the Degree of Responsibility Scale. Activities should be selected to ensure that the Candidate reaches the required level of competency and responsibility.

It should be noted that the Candidate working at DoR Level E carries the responsibility appropriate to that of a registered person except that the Candidate's supervisor is accountable for the Candidate's recommendations and decisions.

6.3 Statutory and regulatory requirements

Candidates are expected to have a working knowledge of the following regulations and Acts, as amended from time to time, and how the legislation affects their working environment:

- Engineering Profession Act, 46 of 2000, its rules and the Code of Conduct
- Occupation Health and Safety Act as amended by Occupation Health and Safety Act, 181 of 1993 (OHSA) – latest revision used
- Labour Relations Act, 66 of 1995
- National Environmental Act, 107 of 1988
- Environment Conservation Act, 73 of 1989 as amended by Environment Conservation Act, 52 of 1994 and Environment Conservation Amendment Act, 50 of 2003
- Water Services Act, 108 of 1997
- National Water Act, 36 of 1988
- Mine Health and Safety Act, 29 of 1996
- Minerals Act, 50 of 1991 and regulations

- Minerals and Petroleum Resources Development Act, 28 of 2002
- Mining Charter
- Mandatory Codes of Practice as determined by the Department of Mineral Resources and Energy
- SANS applicable specifications and other related mining standards
- Chief Inspector of Mines: Directives/Instructions
- Chief Inspector of Mines: Guidelines.

Other Acts not listed here may also be pertinent to a Candidate's work environment. Candidates are expected to have a basic knowledge of the relevant Acts and to investigate whether any Acts are applicable to their particular work environment.

6.4 Desirable formal learning

The following includes useful courses for formal learning:

- Formally registered Continuing Professional Development (CPD) courses
- Project Management (basic)
- Value Engineering
- Negotiation Skills
- Engineering Finance
- Hazard Identification and Risk Assessment (HIRA, HAZOP)
- Quality Systems
- Environmental Impacts
- Management
- Report Writing
- Planning Methodology and Techniques
- Systems Engineering
- Public Speaking
- Digital Technologies

7. PROGRAMME STRUCTURE AND SEQUENCING

7.1 Best practices

There is no ideal training programme structure or unique sequencing that constitutes best practice. The training programme for each Candidate depends on the available work opportunities at the time that the employer assigns to the Candidate.

It is suggested that Candidates work with their mentors to determine appropriate projects to gain exposure to elements of the asset lifecycle and to ensure that their designs are constructable, operable and designed considering lifecycle costing and long-term sustainability. A regular reporting structure with suitable recording of evidence of achievement against the competency outcomes and levels of responsibility needs to be in place.

The training programme should be such that the Candidate progresses through the levels of work capability described document **R-04-T&M-GUIDE-PC** so that by the end of the training period, the Candidate exhibits a Level E Degree of Responsibility and is able to perform individually and as a team member at the level of problem-solving and engineering activity required for registration.

Value Improved Practices (VIPs) are out-of-the ordinary practices used to improve cost, schedule and/or reliability of capital construction projects. VIPs are:

- used primarily during front-end-loading
- formal, documented practices involving a repeatable work process
- mainly facilitated by specialists from outside the project team.

Examples are as follows:

- Technology selection
- Process simplification
- Classes of facility quality
- Waste minimisation
- Energy optimisation
- Process reliability modelling

- Customisation of standards and specifications
- Predictive maintenance
- Design to capacity
- Value Engineering
- Constructability.

7.2 Realities

The minimum period for the Candidacy Phase is stated by ECSA as 3 years after graduating with a recognised qualification as stipulated in Section 2 of this DSTG. The likelihood, however, is that the period of training will be longer. This time frame is determined by the availability of opportunities and the exposure to various functions in the actual work environment.

Irrespective of the route followed, the overriding consideration is that the applicant must provide evidence of competence against the standard and provide objective evidence of meeting the 11 outcomes as stipulated in document **R-08-CS-GUIDE-PE/PT/PN**

7.3 Generalists, specialists, researchers and academics

Document **R-08-CS-GUIDE-PE/PT/PN** adequately describes what is expected of persons whose formative development has not followed a conventional path, for example, academics, researchers and specialists.

Irrespective of the route followed, the overriding consideration is that the applicant must provide evidence of competency against the standard.

7.4 Orientation requirements

For the Candidate Engineer starting a career with an employer, the basic introduction to the company's functions is usually performed during the first months of employment. The induction process usually includes the following aspects:

- Introduction to company safety regulations

- Company code of conduct
- Company staff code and regulations
- Typical functions and activities within the company
- Hands-on experience and orientation in each of the major company divisions
- Overall mining operations and mining-related facilities.

7.5 Moving into or changing candidacy training programmes

This guide assumes that the Candidate enters a programme after graduation and continues with the programme until ready to submit an application for registration. It also assumes that the Candidate is supervised and mentored by persons who meet the requirements stated 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 are completed:

- The Candidate must complete the Training and Experience Summary (TES) and the 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 by the relevant supervisor or mentor.
- On entering the new programme, the mentor and supervisor should review the Candidate's development while being mindful of past experience and opportunities and the requirements of the new programme. At a minimum, the mentor and supervisor should plan the next phase of the Candidate's programme.

REVISION HISTORY

Revision number	Revision date	Revision details	Approved by
Rev O: Concept A	01 Nov 2011	Drafting of point 3	Dr Gordon Smith
Rev 0: Concept B	02 Jul 2012	New draft of template	HH
Rev 0: Concept C	18 Sep 2012	New draft of template	PAC (Mining)
Rev O: Concept D	29 Oct 2012	Standard section 1-3 inserted, formatted	PAC (Mining)
Rev 0: Concept E	22 Feb 2013	Total review/editing of document	PAC (Mining)
Rev 1	12 Mar 2013		Registration Committee for Professional Engineers
Rev 2	11 Jan 2018	As per approved DSTG framework	Mike Rogers
Rev 2	30 Jan 2018	Approval	PDSG
Rev 3 Daft A	18 July 2022	The document has been revised to include new definitions, abbreviations and to update document numbers in cases where the document number of referenced document has changed, for consistency and to align with the internal document numbering requirements. The working group also removed Appendix 1 and 2 and replaced it with the following • Training and Development Considerations • Examples of Professional Development Programmes (PDP) for a Mining Engineer	Working Group
Rev 3 Daft B	01 August 2022	Reviewed submission from working Group	RDD&R BU and Registration BU
Rev 3 Draft C	15 August 2022	Review and recommendation for Approval	Acting RPSC Executive
Rev 3	31 August 2022	Approval	RPSC

The Discipline-specific Training Guide for

Registration as a Professional Engineer in Mining Engineering

Revision 3 dated 31 August 2022 and consisting of 26 pages reviewed for adequacy by the Business Unit Assistant Manager and is approved by the Acting Executive: Research, Policy and Standards (**RPS**)

..... 07 October 2022.....

Business Unit Assistant Manager Date

…….....18 October 2022.....

Acting Executive: RPS Date

This definitive version of this policy is available on our website

APPENDIX 1: TRAINING AND DEVELOPMENT CONSIDERATIONS

This supplement has been prepared to highlight the key elements for the training and mentoring requirements that can be used to assist an applicant in preparing for professional engineer registration. The table below summarises the 11 outcomes where an applicant should be able to demonstrate competence. Further details of these outcomes can be found in the following references:

- Competency Standard for Registration in Professional Categories with reference number **R-02-STA-PE/PT/PN**
- Guide to the Competency Standards for Registration as a Professional Engineer with reference number **R-08-CS-GUIDE-PE/PT/PN**.

OVERVIEW OF OUTCOMES		
GROUP	**OUTCOME**	**DESCRIPTION**
Group A Knowledge Based Engineering Problem-Solving	1	Define, investigate and analyse complex engineering problems.
	2	Design or develop solutions to complex engineering problems.
	3	Comprehend and apply advanced knowledge of the widely applied principles that underpin good engineering practice, specialist knowledge and knowledge specific to the jurisdiction and local conditions.
Group B Managing Engineering Activities	4	Manage part or all of one or more complex engineering activities.
	5	Communicate clearly with others in the course of the engineering activities.
Group C Risk and Impact Mitigation	6	Recognise and address the reasonably foreseeable social, cultural and environmental effects of complex engineering activities.
	7	Meet all legal and regulatory requirements and protect the health and safety of persons in the course of the complex engineering activities.
Group D Act ethically, exercise judgment and take	8	Conduct engineering activities ethically.
	9	Exercise sound judgement in the course of complex engineering activities.

OVERVIEW OF OUTCOMES		
GROUP	**OUTCOME**	**DESCRIPTION**
responsibility	10	Be responsible for making decisions on part or all of the complex engineering activities.
Group E Initial Professional Development	11	Undertake Professional Development that is sufficient to maintain and extend competence.

The following section provides an indicative or suggested development programme for a newly qualified Mining Engineer. While this development programme attempts to be sufficiently detailed, there is cognisance of the various sub-disciplines or practice areas of the mining engineering discipline an individual may pursue in their careers. Therefore, it is advised that this suggested programme is modified on a case-by-case basis to be appropriate for the context in which an applicant operates. It is also advised that the applicant is supported by a mentor (ECSA-registered or otherwise) that adequately understands the context of the sub-discipline or practice area.

It is further noted that for more mature applicants; so long as they can demonstrate competence in the 11 outcomes highlighted above through a process of recognising prior learning and experience, it may not be necessary for them to undergo such a development programme.

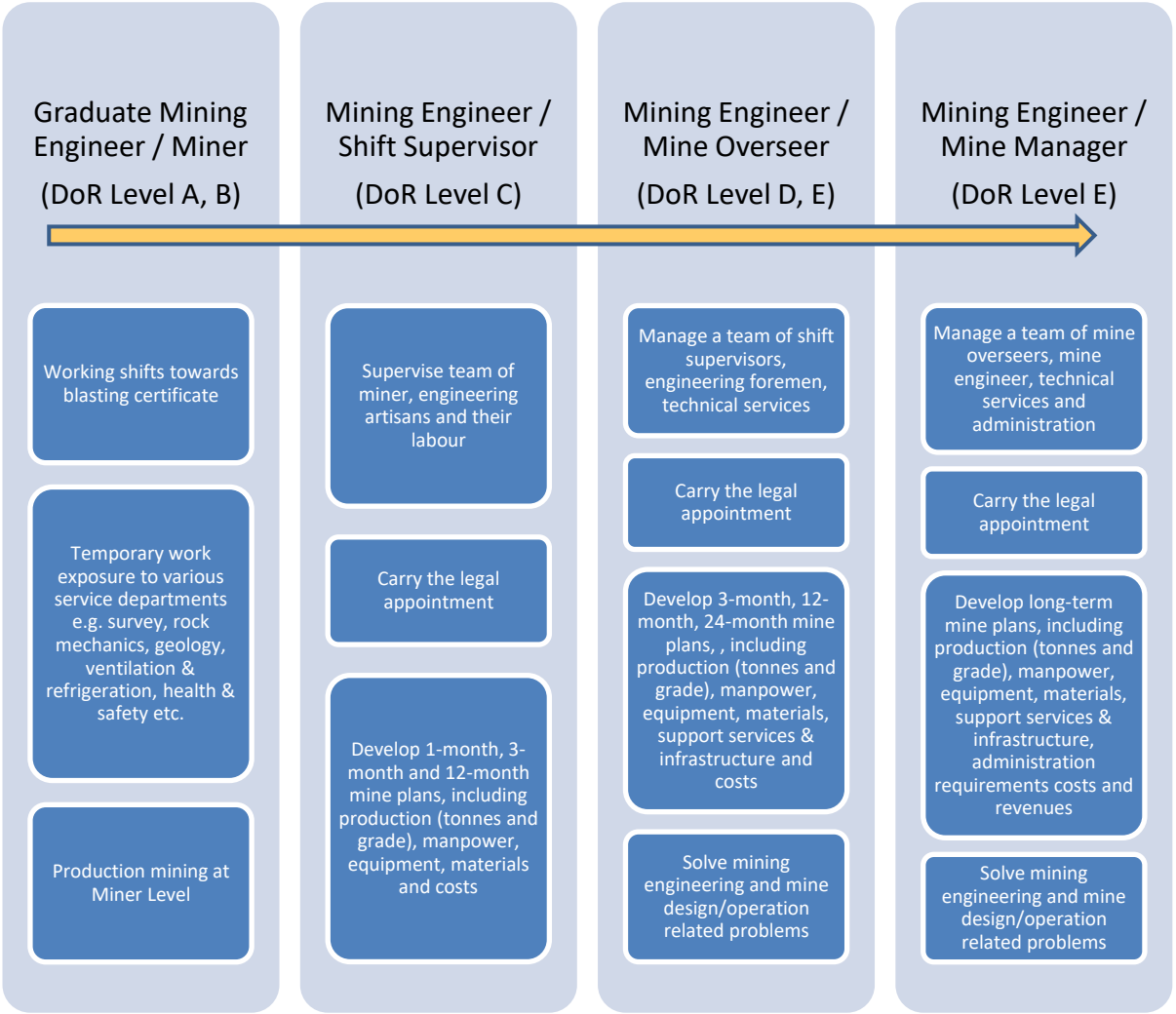
Summary of the Degree of Responsibility			
Level Description	**Nature of Work**	**Responsibility**	**Level of Support**
A Being Exposed	Undergoes induction, observes processes, work of competent practitioners	No responsibility, accept to pay attention	Mentor explains challenges and forms of solution
B Assisting	Performs specific processes under close supervision	Limited responsibility for work output	Supervisor/Mentor coaches, offers feedback
C Participating	Performs specific processes as directed with limited supervision	Full responsibility for supervised work	Supervisor progressively reduces support, but monitors outputs
D Contributing	Performs specific work with detailed approval of work outputs	Full responsibility to supervisor for quality of work	Candidate articulates own reasoning and compares it with that of supervisor

Summary of the Degree of Responsibility			
Level Description	**Nature of Work**	**Responsibility**	**Level of Support**
E Performing	Works in a team without supervision, recommends work outputs, responsible but not accountable	Level of responsibility to supervisor is appropriate to a registered person	Candidate takes on problem solving without support; at most limited guidance

APPENDIX 2: EXAMPLES OF PROFESSIONAL DEVELOPMENT PROGRAMMES FOR A MINING ENGINEER

This supplement provides some simplified examples of development programmes for Mining Engineers, which could include the highlighted activities but are not limited to the following:

Example 1: Mining Engineer in the Mining Production practice area



Example 2: Mining Engineer in a non-production practice area (e.g., Project/Consulting practice area)