BEST PRACTICE GUIDELINE

for the development of

GRADUATE DEVELOPMENT PROGRAMMES:

MINING AND METALLURGY

NOTE: From the President: SAIMM

1. ACKNOWLEDGEMENTS:

Reference has been made to several Graduate Development Programmes within the national and international minerals and metal industry. BHP Billiton, Anglo American, Mining Qualifications Authority SA, Rio Tinto, PPC,

http://www.graduates.riotinto.com/ENG/whataremyopportunities/263_graduate_development.asp

http://www.ey.com/global/content.nsf/South_Africa/Careers_-_Graduate_-_Developing_your_career#1

2. BACKGROUND:

It is well understood that the Southern African Minerals and Metals industry is short of skills. This is no different to the rest of the world when it comes to Mining, Metallurgy and Metals industry. Perhaps the skills needs in these disciplines in the Southern African region, like many other developing economies, **are** still high because of the relatively unpopular remoteness when compared with the developed world.

Opportunities abound for people qualifying with tertiary qualifications in Mining and Metallurgy or associated disciplines, but still many graduates are dissatisfied with their lot as they establish themselves in the various industrial operations.

Whilst SA in particular has a vibrant mining and metals industry and has a strong infrastructure to produce suitably qualified individuals for its future needs, it is recognized that many recent graduates leave the home country in search of greener pastures within two or three years of local employment. It is believed that some of the main reasons for discontentment in the early career years are as follows:

- **Incorrect impression and expectations of what they will be doing;**
- **Given responsibilities beyond their competence;**

- **Not challenged enough for their intellect;**
- **Are not guided into the work environment; and**
- **See greener pastures for added career development.**

3. NEED FOR/PURPOSE OF BEST PRACTICE GUIDELINE:

The SAIMM [1.] believes that many graduates in the Mining and Metallurgical practice areas will find their own way in companies of their own choice. They will be guided by quality development programmes and will route out a career path that suits them and the company they may belong to. The SAIMM however also believes that the publication of a ***Best Practice Guideline (BPG) for Graduate Development Programme (GDPs [1.])*** will assist not only the individual recent graduate, but also companies (and especially SMMEs[1.]) in making the most of the employment relationship in what is seen as an important stage of the employment relationship. First impressions are important for both the recent graduate and the company. Of necessity this deals with generic (common) issues.

The purpose of this BPG [1.] is to contribute to maximizing the recruitment and retention efforts of local and regional talented and qualified persons in the disciplines of Mining and Metallurgical practice areas, and **engineering in general in the SA Mining and Metallurgical Sector**. Its objective is to enhance the satisfaction of recent graduates as they make decisions in their early career development and to provide a framework for companies that many not have infrastructure to guide and assist these recent graduates. The document introduces the different components that should be part of a GDP. The actual details and implementation will depend on the company-specific graduate's needs and expectations.

The benefits associated with the use of GDPs which are based on a BPG is that it promotes recognition and portability of competencies thus achieved, both for the Company as well as the Mining and Metallurgical graduates as well as consistency in regard to competent engineering practitioners.

4. DETERMINING FACTORS IMPACTING ON BPGs

The development of engineering graduates are subject to the following critical determining factors ("*drivers*"):

4.1 <u>Duties and Responsibilities of Employers and Managers</u>

The duties and Responsibilities of the Employers and Managers prescribed in terms of the MHSA [1.] as it applies the competency of employees include the following:

(a) The Employer is accountable for Occupational Health and Safety (OH&S) of persons at Mines [Section 5, Mine Health and Safety Act (MHSA) 1996, Act 27 of 1996 as amended].

(b) The Employer must provide training and may only use competent persons at Mines (Section 10, MHSA).

(c) The Employer may appoint other competent persons to assist the Employer (Owner) to comply with duties and responsibilities of Employer [Section 7.(2), MHSA].

(d) The Manager appointed by the Employer in terms of Section 3.(1)(a) of the MHSA may appoint other competent persons to assist the Manager to comply with the duties and responsibilities of the Manager in terms of the MHSA [Section 7.(4), MHSA].

(e) The Employer is duty-bound to manage the OH&S-related hazards and concomitant significant risks at a mine on a site-specific basis (Section 11, MHSA).

4.2 Definition of Competent Person

With the exception of the definition of *competent person* as per the MHSA, which regrettably does not reflect the outcomes-based competency paradigm, no other official definition of *component person* could be found.

The MHSA defines a competent person as a person who:

"(a) is qualified by virtue of his/her knowledge, training skills and experience to organize the work and its performance;

(b) is familiar with the provisions of the MHSA and the regulations which apply to the work to be performed; and

(c) has been trained to recognize any potential or actual danger to occupational health and safety in the performance of the work;

or

(d) is in possession of the appropriate certificate of competency where such certificate is required by these regulations".

Competent person can be more appropriately derived/interpreted from the SAQA [1.] definition of competence as follows:

"competent person means a person who demonstrates the ability, specified in terms of knowledge, specific skills or integrated cluster of skills, capabilities and values, executed within an indicated range or context and to specific standards;

- *of performance;*
- *an integrated understanding of performance and its knowledge base;*
- *an understanding of the system in which the performance is carried out;*
- *the ability to transfer to other related contexts, and*
- *the ability to innovate when appropriate,*

and

*who is in possession of an appropriate and valid SAQA qualification **or** agreed cluster of SAQA unit standards registered on the National Qualifications Framework (NQF [1].)".*

4.3 Progression, Articulation and Access in the Engineering Profession Context

The Engineering profession is structured using two organizing principle namely categories of registration and stages of development:

- The *categories of registration* express the fact that engineering work requires different roles. At the professional level four categories are defined in the Engineering Profession Act (EPA [1].): Professional Engineers, Professional Engineering Technologists, Professional Certificated Engineers and Professional Engineering Technicians; and
- The "*development process*" of an engineering professional has several *stages* or milestones at which a person must demonstrate achievement: completion of basic (secondary) education, completion of a higher education qualification, attainment of registration and, in some cases, attaining registration on an international register. The normal or benchmark development process in each category involves the attainment of an educational qualification ("*Stage 2* [1.; 2].") defined for the category, a period of work-based training and experience ("*Stage 1* [1.; 2.,]") culminating in an integrated competency assessment leading to registration.

The benchmark route is described as *vertical progression* in the Higher Education Framework policy document. Systems of education, training and assessment for registration are defined around these category-based vertical pathways. The ability to switch from one category-based pathway to another is referred to as *articulation.* Switching may take place at various stages in a person's education or professional career. While this paper is concerned mainly with the professional categories, it recognizes that persons may switch into a professional category pathway from a related supporting occupation or trade. Similarly, switching into engineering may be from a related field such as the physical sciences.

DIAGRAM 1 reflects the HEQF-compliant **"*Framework of Engineering Qualifications and Professional Designations* [2.]".**

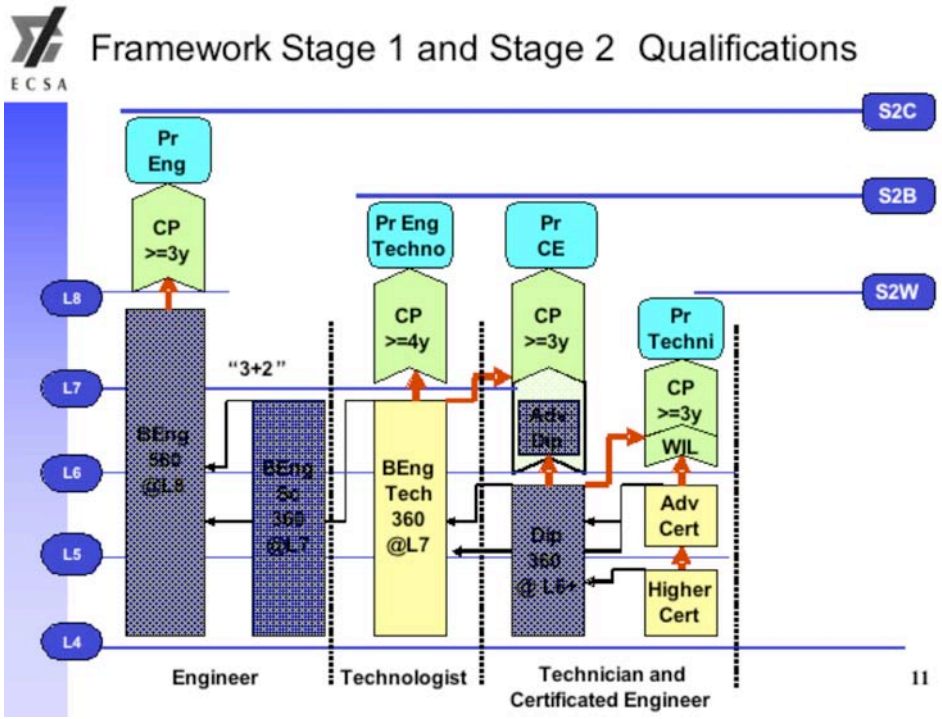

DIAGRAM 1: The current HEQF-compliant **"*Framework of Engineering Qualifications and Professional Designations* [2.]"**

Some of these OBET-compliant competency standards are intended to replace current "*Industry-recognised Qualifications*" such as the certificates-of-competence (CoCs) currently issued by the Department of Minerals Resources (**DMR** [1.]) and the Chamber of Mines of SA (CoMSA [1.]). The said "*Industry-recognised Qualifications*" are NOT considered OBET-compliant.

4.4 Regulation of the Engineering Professing in the RSA

The Government has demonstrated political will to protect the "*public interest*" (health and safety of the public) and the environment specifically in regard to the Built Environment. This is expected to be achieved by regulating 6 professions under the Built Environment Act 2000, Act no 43 of 2000 supplemented by 6 subservient Acts inclusive of the Engineering Profession Act 2000, Act No 46 of 2000. The latter Act will regulate the engineering profession in the Built Environment.

The regulation of the said professions will be achieved as follows:

- unregistered persons will be prohibited from performing "*identified work*" peculiar to the Built Environment;
- work thus identified will be reserved for registered persons who will be held accountable for their actions in a manner consistent with Government's Competition Policy, which protects the public interest; and

- it provides for disciplinary recourse in respect of professional conduct.

The proposed Identification of Engineering Work (IDoEW [1.; 4.; 5.]) covers the following critical aspects:

- purpose of work identification in the RSA;
- regulatory backdrop to the IDoEW [4.; 5.];
- thinking behind the proposed IDoEW [4.; 5.];
- engineering Council of SA's (ECSA) IDoEW Project;
- what constitutes "*engineering work*" [4.; 5.];
- what constitutes *"identified engineering work*" [4.; 5.]; and
- what happens after the Minister of Public Works has promulgated the proposed IDoEW Regulations. [4.]

4.4.1 Engineering Work (EW)

To be read in conjunction with [2.; 3. and 4.]

Regulation 5.(1)(a) through (j) lists the **TYPES OF WORK** associated with engineering disciplines, whilst Regulation 5.(2)(a) through (j) lists the **TYPES OF ENGINEERING WORK** associated with areas of engineering application or activity.

Regulation 5.(3)(a) through (i) lists the **TYPES OF ENGINEERING WORK** and situations with special risks that require mitigation.

4.4.2 Identified Engineering Work (IEW)

To be read in conjunction with [2.; 3. ; 4. and 5.]

Affirmative answers to one or more of the questions relating to the **TYPES OF ENGINEERING WORK** listed in Regulations 5.(1) **plus** 5.(2) **plus** 5.3 establishes that an engineering practitioners performs EW [1.].

Regulation 6 lists the following Characteristic level of Competencies for Professional Engineering Categories vis-à-vis:

- Professional Engineer (*"complex*" level of engineering work) [2.; 3.];
- Professional Engineering Technologist ("*Broadly-defined"* level of engineering work) [2.; 3.];
- Professional Certificated Engineer/Manager ("*Broadly-defined*" level of engineering work) [2.; 3.]; and
- Professional Engineering Technician ("*Well-defined*" level of engineering work) [2.; 3.];.

The abovementioned definitions are also referred to as the "*Contextual Level Descriptor for Engineering Practitioners"* [2.; 3.].

4.5 Quality Assurance (QA)

One of the critical aspects of an Outcomes-based Education and Training (OBET [1]-compliant dispensation is that competency assessment (QA) is conducted against and in compliance with OBET-complaint competency standards registered on the 10-Level NQF.

5. COMPONENTS OF AN ENGINEERING GDP

The development of individual GDPs must comply with the following requirements:

- the generic (common) and portable GDP requirements set out in this BPG; **plus**
- the discipline-specific portable GDP requirements set out in the ECSA's relevant Discipline-specific Guidelines; **plus**
- the individual graduate's specific level of development subject to agreed Recognition-of-prior-Learning.

5.1 Generic (common) Component of an Engineering GDP

The "*generic (common)*" component of an Engineering GDP should at least address the following aspects:

(a) Recruitment Interview

It is common practice to arrange employment interviews which is the start to the possible employment relationship. At the interview there should be frank and honest discussions of the future expectations from both the employer and the prospective employee. The discussions should be minuted or recorded and these recorded placed on record for both the graduate and the employer.

The interview should not be time limited and the graduate should be encouraged to interrogate the employer expectations and the opportunities or problems that could be expected. The graduate may be given the opportunity or required to place in writing his understanding of the important parts of the interview process, before finally accepting the employment conditions. One of the important discussion points will be the detail of the personalized GDP that the graduate will participate with. This will ensure no misunderstanding as the development of the graduate takes place.

(b) Orientation ("*induction*")

All categories of engineering graduates should be given a comprehensive orientation (induction) into the company. This will involve exposure to Occupational Health and Safety courses, visit to all components of the company, meeting with senior managers and executives across the broad range of activities of the company. This should typically take at least 2 weeks and be as comprehensive as possible. It could include such social functions as lunch with the executive team and an introduction to social activities and other similar individuals. The outcomes of such orientation to be communicated to the learner before engaging such learning.

(c) Career Mapping

To be read in conjunction with paragraph 4. herein before.

Any career development programme (GDP) should have a long term objective – "Where would you expected to be in 10 – 15 years." The said GDP should be aimed at this long term perspective and include the typical time lines for steps to be completed to achieve the goal. A graduate would always have ambitions (realistic or not) that would involve a long term view and the objective of the GDP should be aligned to this long term view. This component will (like many others) be adjusted to meet the reality of the individuals progress during his/her personalized GDP.

(d) Culture Adaption

To be read in conjunction with paragraph 5.(b) herein before.

Every company has a unique corporate culture. The graduate should be made aware of the company norms of behaviour (e.g. dress code), time keeping, bureaucracy, reporting formalities, protocols, outside work activities (e.g. community work), expectation etc that are seen as an important part of culture adaption. The graduate should be exposed to this aspect as early on in his/her personalized GDP.

(e) Providing Challenges

To be read in conjunction with paragraph 5.2 herein after.

Any graduate would need to be intellectually challenged particularly in the early stages of the employment contract.

The graduate should be given substantive research work to conduct appropriate to the long term outcomes of the personalized GDP. Responsibility should be given for substantive work as early as practically possible. A graduate without challenges will become dissatisfied and stagnate.

(f) Inter-and Intra Company Placements

To be read in conjunction with paragraphs 5.1(c) and (e).

As opportunities arise and where ever possible, the engineering graduate should visit or work in as broad a range of activities as possible during the his/her personalized GDP. International perspectives have a positive influence on the operations especially if applied through youthful intellect. The positive results of such opportunity will impact both on the graduate and the company. Intra company visits and work opportunity in different sections of the operations gives great perspective and develops the graduate optimally for the long term.

(g) Conflict Indicators

Recent graduates may become despondent or frustrated at some time during the rolling-out of their personalized GDP. Mechanisms must be put in place to identify these conditions so as to maximize the effective development of the individual. Reporting and communication must be a major component of the personalized GDP. This, together with open dialogue will minimize the effects and provide for early detection of such conflict conditions.

(h) Establishing and Utilisation of individual Talents

To be read in conjunction with paragraphs 5.1(c) and (e).

Engineering graduates will often bring with them far more than just technical academic knowledge. These attributes or talents may be utilized and developed further during their personalized GDPs to the benefit of both the graduate and the organization. Particularly such attributes as teaching, sport, and music could be considered. The graduate should be encouraged to participate in the development of others using their additional talents or skills. This will develop community engagement and respect within the community

(i) Social Integration

To be read in conjunction with paragraphs 5.1(c), (d) and (h).

Engineering Graduates must be integrated into the community as well as in the work environment. Graduates-in-Training (GIT) should be required to present themselves in socially acceptable ways. This could be in terms of cultural understanding (appropriate behaviour in special conditions), etiquette, dress, introductions, names, public speaking, presentations etc. Such development should form a part of the Graduate Development Programme.

(j) Community Development

To be read in conjunction with paragraphs 5.1(c), (d), (h) and (i).

GITs must participate in community projects on a "voluntary" basis. This should be a part of the GITs personalized GDP.

(k) Individuality

To be read in conjunction with paragraphs 5.1(c), (d), (h), (i) and (j).

Although there are generic components to the ideal (generic) GDP, it must be clear that each programme is individualized (personalized) to take into account the particular discipline of the graduate, specific needs of the GIT, and in particular the requirements and needs of the company.

(l) Membership of relevant Professional Associations

During the roll-out of the personalized GDP, the GIT should be actively encouraged to become a member of the relevant professional body or learned society. The graduate should also be encouraged to actively participate in the professional body.

(m) Career Development Progress Evaluation

To be read in conjunction with paragraphs 5.1(c), (d), (h), (i), (j), (k) and (l) herein before.

Formalized progress interviews by senior officials must be incorporated into the personalized GDP. This would be more frequent at the start of the employment contract e.g. during the first year every 3 months and then in the subsequent years at least twice per year.

5.2 Personalized component of the GDP

Personalized GDPs for each GIT need to comply with the following criteria/contain the following aspects:

- the prescribed generic (common) aspects referred to in paragraph 5.1 herein before; **plus**
- the prescribed personalized (individualized) aspects referred to in paragraph 5.2(a) through (i) of this BPG.

(a) Registration with the ECSA [1.]

To be read in conjunction with paragraphs 4.2 and 4.3 herein before.

As qualified engineering practitioners will be expected to perform "***engineering work (EW [1.])***" as defined in the Built Environment Act, the graduate must be supported and coached in accordance with the requirements of ECSA.

The graduate should register as a "Candidate" at the appropriate level for the work he is expected to be involved with in the long term e.g. Professional Engineer, Professional Engineering Technologist, Professional Engineering Technician or Professional Certificated Engineer. This registration also depends on the base qualification. Supporting Engineering Professional mentors should be appropriately identified and approached. ECSA stage 2 professional development towards appropriate registration should be monitored as progress occurs. The whole of the ECSA registration process should be part of the graduate development programme unless the choice of direction is not particularly directed to engineering work.

ECSA demands Continuous Professional Development (CPD points) activities. These activities must be carried out at accredited engineering functions so as to ensure lifelong learning. This is in line with the requirements of a successful Graduate Development Programme (see ECSA's Policy on CPD [1.]).

(b) Quality Assurance through C&U

To be read in conjunction with paragraphs 5.2(a) and (b) herein before.

ECSA's quality assurance system is based on the establishment of an appropriate Commitment-and-Undertaking (C&U) between the Employer and the ECSA (see www.ecsa.co.za). ECSA's C&U requires that personalized GDPs be rolled-out under the direction and control of a registered **MENTOR** [6.; 7.; 8. and 9.].

Beyond the formalized training activities and line management functions, every recently employed graduate should seek out (with the aid of the company) a suitable mentor. Such a person would normally be within the company but this may not necessarily be so. A mentor would be some person who has reached a senior position in the direction that the graduate wishes to follow. The mentor would not be within three line management levels of the graduate. The purpose of explicitly including such a person in the development programme is to ensure early detection of problems and maximizing the potential of the graduate. The mentor would be a person who is selected by the graduate. Formalized regular interaction would take place between mentor and mentee with discussions on both work and social problems and opportunity areas.

(c) Providing Opportunities

To be read in conjunction with paragraphs 5.2(a) and (b) herein before.

GITs are innovative. Opportunity should be given as early as possible for the graduate to make a substantive contribution appropriate to his skills. This can be in the work environment or the social environment. Opportunities for self development should be provided and supported. The innovative spirit of the graduate must be nurtured for the long term development of the graduate.

(d) Formal Complementary Education and Training

To be read in conjunction with paragraphs 4., 5.1 and 5.2 herein before.

GITs are employed by companies for different purposes. Any development programme for graduates must include both in-house and external, formal complementary development courses where the graduate would be expected to gain theoretical and or practical knowledge for the purpose of his employment. Beyond the purely utilitarian courses the graduate should be given the opportunity to develop a broad range of additional complementary knowledge linked to the company operations. One would hope that the purpose of employment of a graduate would be to develop such person into senior positions and this would be achieved by broad development and promotion of lifelong learning. Such areas as conflict management, report writing, assertiveness, language proficiency, communication, project planning, personal finance, management finance, specialist software etc as appropriate, should be included in the development plan. Individual performance and interest in the courses must be monitored.

The need for special complementary courses could be identified through formalize psychometric tests – naturally graduates arrive in the company with different levels of attributes and deficiencies. An effective GDP will include psychometric tests to identify areas of strength and areas of weakness. A graduate should admit weaknesses and be grateful for the opportunity to overcome these weaknesses through interventions supported by the company.

It could be that even physical fitness is a requirement and in any case, any graduate would be convinced that mental and physical fitness result in better work performance. This could well be included in a comprehensive personalized GDP.

(e) Confidence Building

To be read in conjunction with paragraphs 5.1, 5.2(a) through (d) herein before.

Included in the personalized GDP, there would be provision made for "*confidence builders*". If areas of weakness have been identified then logical small steps are to be included to overcome the weaknesses, through the inclusion of meaningful step by step confidence builders. In any event, confidence must be justified by the achievement of certain goals within the said personalized GDP. This could include such items as: visits to the work place from senior officials, panel interviews, work project reports of success etc.

(f) Exposure to Engineering Practice

To be read in conjunction with paragraphs 4., 5.1 and 5.2(a) through (f).

The exposure to engineering practice must consider the contextual requirements of the specific discipline and be in compliance with ECSA's relevant Discipline-specific Guidelines (see [10].).

It must be accepted that any graduate will have probably unrealistic expectations of his abilities in the real world of work. The gap between academic learning and the operations of an organization is particularly high in the engineering disciplines. Work-based learning is the learning that takes place in the work environment dealing with sometimes routine operational matters that the graduate could find particularly challenging (getting your hands dirty). This would be particularly true in most careers in the mining and metallurgy fields. The graduate may feel that the operational components are below their level whilst the company expects the graduate to be particularly skilled in these operational aspects. This conflict situation must be resolved by a formal inclusion in the graduate's personalized GDP of the detail of experiential learning required by the company. Time periods for operational components of work-based learning should be limited to ensure that the graduate realizes that this is for the purpose of development and understanding rather than operational competency at the experienced level. The development of any graduate will depend on his background life experiences. Flexibility must be maintained in the programme to develop the necessary skills before progressing to new areas of development.

Operational work skills breed a different type of confidence to academic university skills. Attempts must be made that the personalized GDP overlaps and supplements academic skills with operational skills. This is best done by including project work with the operational skill development so that a degree of intellect can be incorporated into the operational skills development. (An example of this is where a mining engineer is required to learn the work of the Miner, Shift Overseer and Mine Overseer). This ensures that intellectual capacity is included and a positive improvement in operations may be an outcome. This will in turn lead to strong confidence building of the graduate.

Work-based learning takes place under the supervision of an experienced and qualified supervisor. Care must be exercised in the selection of the supervisor so that the maximum benefit is achieved and good work habits are cultivated.

(g) Time-line for GDPs

Although Outcomes-based Education and Training is principally NOT time-based, experience has indicated that OBET-complaint learning takes time. To this end, ECSA's Stage 2 ELOs indicates that Engineering GITs takes at least 3 years to achieve the prescribed level of competency required at the exit level. The said personalized GDPs must therefore indicate the planned time to be spent on each phase and element of the said GDP subject to the statement of clear learning outcomes to be achieved during each phase or element of the personalized GDP.

(h) Employment Contract

Together with normal conditions of employment for any employee an employment contract with a recent GIT should have special components dealing with the agreed, personalized GDP. This will formalize the employer expectation and ensure the GIT understands the purpose and implications of the said personalized GDP.

6. REFERENCE DOCUMENTS

The following relevant Reference Documents may be found on the SAIMM's website at:

www.saimm.co.za

1. *"List of abbreviations (acronyms) and definitions used",* dated April 2010.

2. *"Engineering Qualifications and the HEQF",* dated 31 October 2008.

3. *"Level Descriptors: Definitions of Complex", "Broadly-defined" and "Well-defined"* engineering work.

4. *"Proposed IDoEW Regulations"*, dated 07 January 2010.

5. *"An Overview of the proposed IDoEW Regulations".*

6. *"Policy Statement R2/1.A: Acceptable Engineering Work for Candidate Engineers",* dated 09 September 2004.

7. *"Policy Statement R2/1.B: Acceptable Engineering Work for Candidate Engineering Technologists",* dated 06 June 2002.

8. *"Policy Statement R2/1.C: Acceptable Engineering Work for Candidate Engineering Technicians Engineers",* dated 09 September 2004.

9. *"Policy Statement R2/1.D: Acceptable Engineering Work for Candidate Engineers",* dated 09 September 2004.

10. "*Discipline Specific Guidelines: Mining Engineering*", dated 28 August 2001.

LIST OF ABBREVIATIONS (ACRONYMS) AND DEFINITIONS USED

BPG	=	Best Practice Guideline
CoC	=	Certificate of Competency
CoMSA	=	Chamber of Mines of SA
DMR	=	Department of Mineral Resources
Drivers	=	Determining Factors
E&T	=	Education and Training
ECSA	=	Engineering Council of South Africa
ELO	=	Exit Level Outcome
EPA	=	Engineering Profession Act 2000, Act 46 of 2000
ESGB	=	Engineering Standard Generating Body
ETQA	=	Education and Training Quality Assurer
EW	=	Engineering Work
FET	=	Further Education and Training
GDP	=	Graduate Development Programme
HET	=	Higher Education and Training
I&APs	=	Interested and Affected Parties
IDoEW	=	Identification of Engineering Work
IEW	=	Identified Engineering Work
LtP	=	License to Practice
M&M SGB	=	Standard Generation Body for Mining and Minerals
MHSA	=	Mine Health and Safety Act, 1996 (Act No 29 of 1996 as amended)
MQA	=	Mining Qualifications Authority, SETA for the SAM&MS
NC	=	National Certificate
NQF	=	National Qualifications Framework
OBET	=	Outcomes-based Education and Training
OFO	=	Organising Framework of Occupations
OH&S	=	Occupational Health and Safety
PA	=	Practice Area
QCTO	=	Quality Council for Trades and Occupations
RPL	=	Recognition of Prior Learning
SAIMM	=	The Southern Africa Institute of Mining and Metallurgy
SAM&MS	=	SA Mining and Minerals Sector
SAQA	=	SA Qualifications Authority
SETA	=	Sector Education and Training Authority
SGB	=	Standards Generation Body
SMMEs	=	Small and Medium Scale Mining Enterprises
STAGE 1	=	Achievement of the relevant accredited SA or recognised substantially comparable educational qualification registered for that purpose on the 10-level NQF.
STAGE 2	=	Successful integrated assessment against the Work-integrated-Learning exit level learning outcomes registered for that purpose on the 10-level NQF.
U/G	=	Underground

US	=	Unit Standard
W/S	=	Workshop

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Engineering Qualifications and the HEQF

Technology Qualifications SGG

October 31 2008

1

Higher Education Qualifications Framework

- Policy on Higher Education Qualifications: Oct 2007
  - Replaces NATED 116, 150 & 151
  - The HEQF is an integral part of the NQF
  - Based on 10 -level NQF
  - Sets common parameters and criteria for design of higher education qualifications
  - Transition arrangements are evolving: See Joint Communique No 2 of DoE, CHE & SAQA
- New NQF Act places responsibility with CHE for
  - Quality assurance of provider programmes (CHE to be Quality Council)
    - Delegation of programme accreditation to professions
  - Standards generation and setting (Delegation model?)

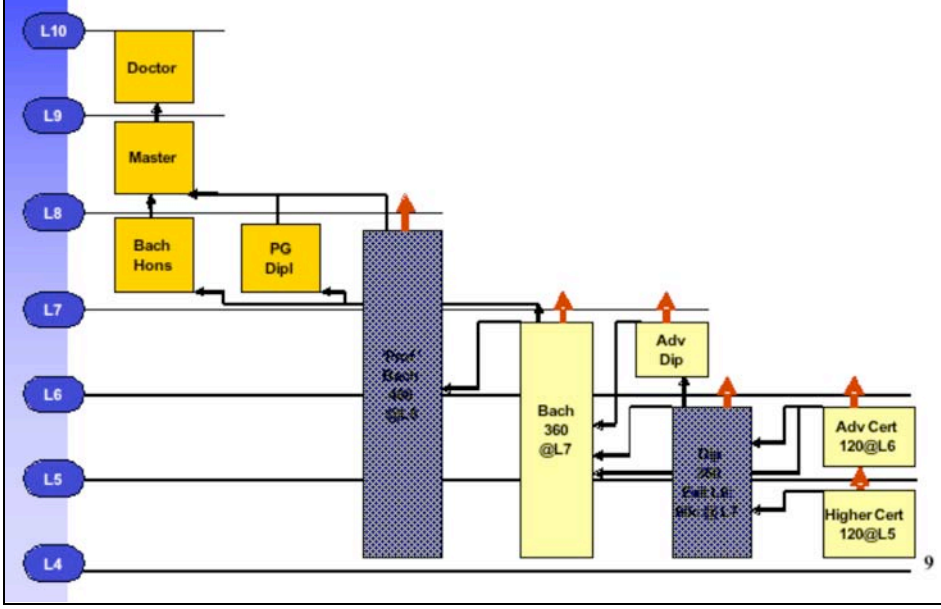
5

Characteristics of qualifications type

- Type Specification
  - Undergraduate: Higher Certificate, Advanced Certificate, Diploma , Advanced Diploma, Bachelor 's Degree
  - Postgraduate: Postgraduate Diploma; Honours Bachelor Degree, Masters Degree, Doctoral Degree
- NQF Level, Minimum credits: total and at exit level
- Naming Rules
  - Permitted Designators, Qualifiers, Abbreviations
  - Type | Designator | 1 st Qualifier | 2 nd Qualifier
  - Bachelor of Engineering | in Civil Engineering
  - Diploma | in Mining Engineering | in Shaf t Sinking
- Broad purpose and characteristics
- Minimum admission requirements
- Progression

6

HEQF Delivery Model Menu



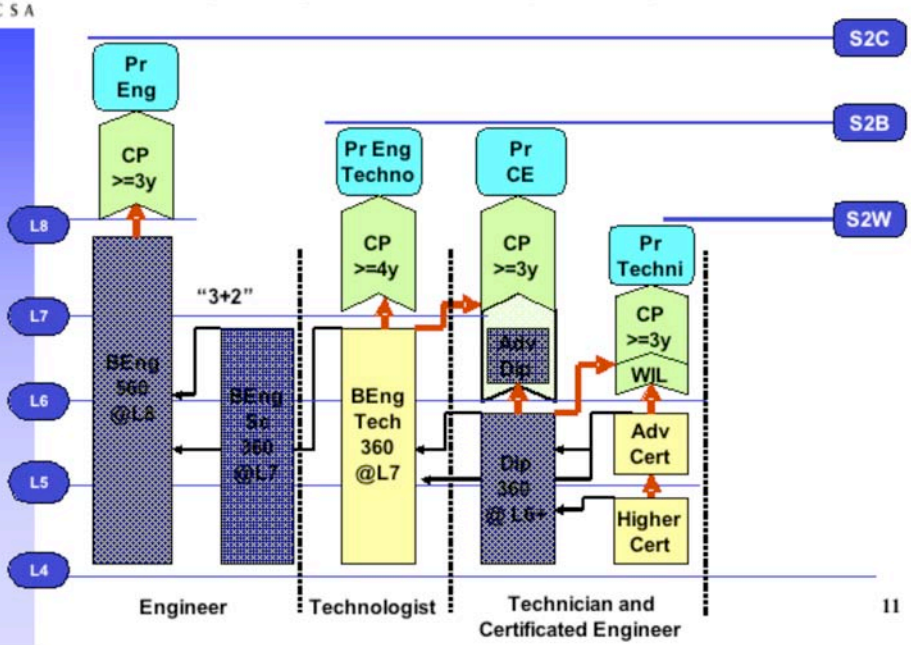
9

The Problem

- We need to define education qualifications for the educational requirement toward registration as:
  - Professional Engineer
    - (560 cr with 120 cr @ L8)
  - Professional Engineering Technologist
    - (360+ cr with 120 cr @ L7)
  - Professional Engineering Technician
    - (240+ cr with 120 cr @ L6 + WIL)
  - Profesional Certificated Engineer
    - As for technologist with specific content
- We are constrained by the HEQF qualifications
- Fitness for purpose *versus* framework constraints
- Best fit shown next

10

Putting Stage 1 and Stage 2 together



11

Engineering Team Member Profiles

Professional Engineers	Professional Engineering Technologists	Professional Engineering Technicians
are characterised by:		
• Solving problems, developing components, systems, services and processes by analysis, synthesis, creativity, innovation and applying fundamental and engineering principles	• Applying established and newly developed engineering technology to solve problems, develop components, systems, services and processes.	• Applying proven, commonly understood techniques procedures, practices and codes in support of engineering activities.
• Providing technical and commercial leadership through well -developed interpersonal skills.	• Providing leadership in applying technology and commercially and have well - developed interpersonal skills	• Managing and supervising engineering operations, construction and activities.
• Working independently and responsibly, applying original thought and judgement to technical and risk -based decisions in complex situations	• Working independently and responsibly, applying judgement to decisions arising in the application of technology to problems and associated risks	• Working independently and responsibly within an allocated area or under guidance of an engineer or technologist

Engineering Team Member Profiles

Professional Engineers	Professional Engineering Technologists	Professional Engineering Technicians
• Optimising technical performance, costs and benefits to clients and community while achieving desired outcomes within the context of a safe and sustainable environment	• Ensuring that engineering solutions meet performance requirements and accepted minimum standards for the community 's safety and welfare	• Ensuring that engineering solutions meet performance requirements and accepted minimum standards for health and safety
To achieve this their knowledge encompasses		
• a broad, fundamentals -based appreciation of engineering sciences, with depth in specific areas, together with financial, commercial, legal, social and health, safety and environmental matters	• an understanding of engineering sciences underlying a deep knowledge of specific technologies, together with financial, commercial, legal, social and health, safety and environmental matters	• A working understanding of engineering sciences underlying the techniques used, together with financial, legal and health, safety and environmental methodologies

Exit Level Outcomes: Common Stem

ELO 1: identify, assess, formulate and **solve engineering problems**	**ELO 6: communicate** effectively, both orally and in writing, with engineering & wider audiences
ELO 2: use **math, basic science & engineering science** knowledge to solve engineering problems	**ELO 7: assess impact** of engineering activity on social, industrial & physical environment
ELO 3: perform **design and synthesis** of solutions	**ELO 8: work effectively** as an individual, in teams.
ELO 4: design and conduct **investigations** and experiments	**ELO 9:** engage in **independent learning** through well developed learning skills.
ELO 5: use appropriate engineering methods, **skills and tools**, including those based IT	**ELO 10: act professionally and ethically**, exercise judgment and take responsibility within own limits

Form of Outcome Statement

Engineer	Engineering Technologist	Engineering Technician
Conduct investigations of *complex problems* including • design of experiments, • analysis and interpretation of data, • synthesis of information to provide valid conclusions	Conduct investigations of *broadly-defined* problems; • locate, search and select relevant data from codes, data bases and literature, • design and conduct experiments to provide valid conclusions.	Conduct investigations of *well-defined* problems; • locate and search relevant codes and catalogues, • conduct standard tests and measurements.

- This is the ELO 4 "Investigation and Experimentation" outcome across three Stage 1 programs
- Note gradation by use of problem classification

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Form of Range Statement

Engineer: *Complex problems*	Engineering Technologist: *Broadly -defined problems:*	Engineering Technician: *Well -defined problems:*
•Problems require *identification and analysis* , and may be concrete or *abstract* , may be divergent and may involve *significant uncertainty* .	• Problems require *identification and analysis* may be concrete, but ill -posed or have a degree of uncertainty.	• Problem statement is *concrete* , requirements are largely complete and certain, but may require refinement.
•Problems may be *infrequently encountered* types and occur in unfamiliar contexts.	• Problems may be *unfamiliar* , but are capable of interpretation for solution by technologies in *practice area* .	• Problems may be *unfamiliar* , but occur in *familiar contexts* and are amenable to solution by established methodologies.
•*Approach* to problem solving needs to be found, is creative and innovative.	• *Approach to* solution involves using structured analysis techniques in well -accepted, creative and innovative ways.	• *Approach* to solution involves standardized methodologies or codified best practice.
•…	• …	• …

Form of Range Statement

Engineer: *Complex problems*	Engineering Technologist: *Broadly -defined problems:*	Engineering Technician: *Well -defined problems:*
•*Information* is complex and possibly incomplete, requiring validation and critical analysis.	• *Information* is complex and possibly incomplete, requires validation, supplementation and compilation into the information base.	• *Information* is concrete and largely complete, requires validation and possible supplementation.
•*Solutions* are based on theory, use of first -principles and evidence, (which may be incomplete) together with judgement where necessary.	• *Solutions* may be partially outside standards and codes, may require judgement, and may operate outside standards and codes with justification.	• *Solutions* are encompassed by standards, codes and documented procedures; judgment of outcome is required.
•Involves a variety of *interactions* which may impose conflicting *constraints, premises, assumptions restrictions*	• Involves a variety of *factors* which may impose conflicting *constraints , premises, assumptions or restrictions.*	• Involves several *issues* , but with few of these imposing conflicting *constraints , premises, assumptions or restrictions* within limitations of procedures.

Source: Range Statement to ELO 1.

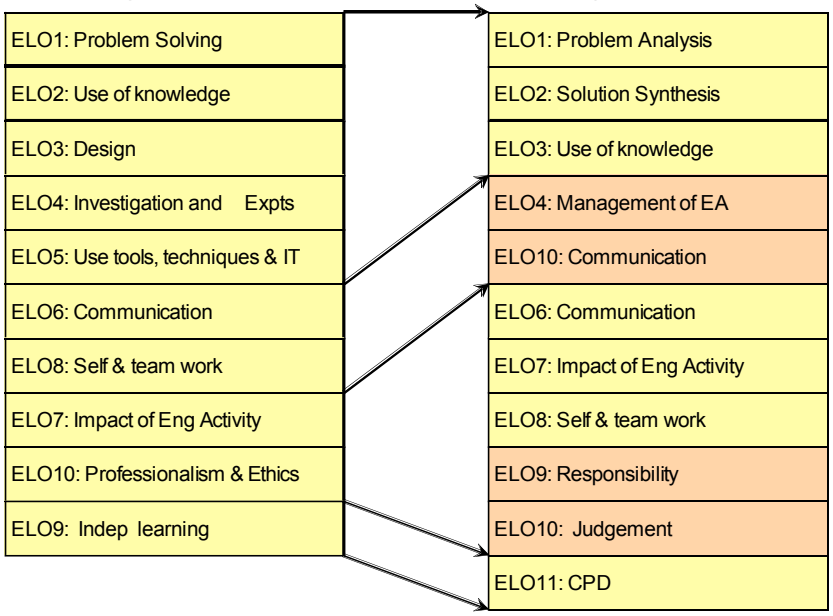
Knowledge Base

- Minimum total credits
- Credits at exit level
- Baseline credits in each knowledge area

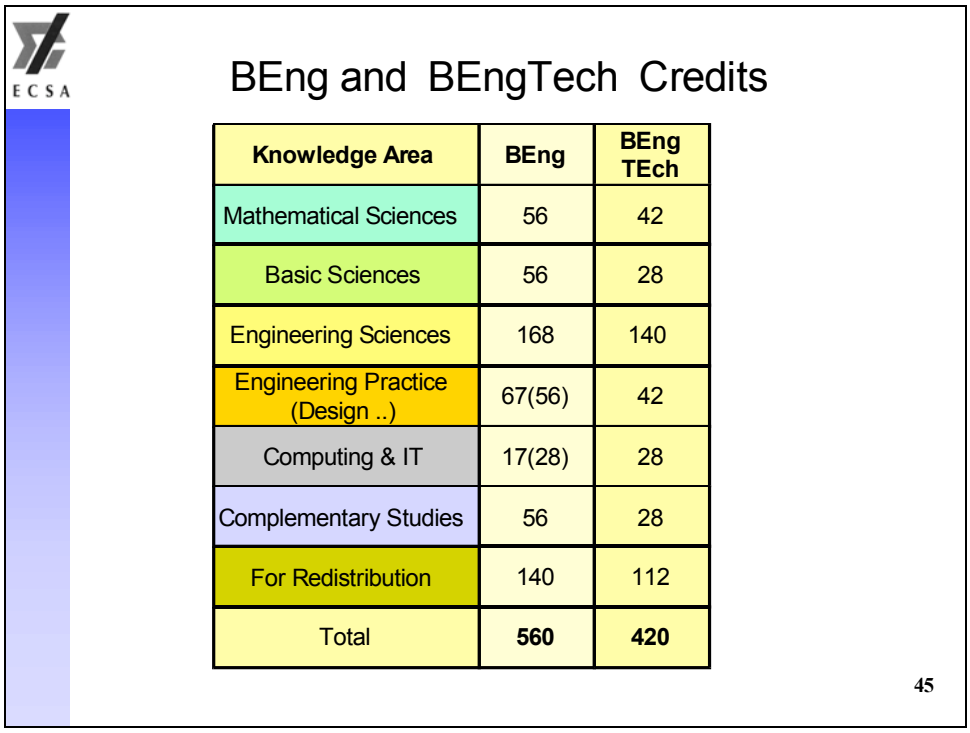
Knowledge Area
Mathematical Sciences
Basic Sciences
Engineering Sciences
Engineering Design ..
Computing & IT
Complementary Studies
Engineering Practice (work -based)
For Redistribution (≤ 25% of Total)
Total

19

Progression: Education to Registration



20


ECSA
BEng and BEngTech Credits
Knowledge Area
BEng
BEng TEch
Mathematical Sciences
56
42
Basic Sciences
56
28
Engineering Sciences
168
140
Engineering Practice (Design ..)
67(56)
42
Computing & IT
17(28)
28
Complementary Studies
56
28
For Redistribution
140
112
Total
560
420
45

ANNEXURE B

PROPOSED REGULATION
PUBLISHED BY MINISTER OF PUBLIC WORKS

Identification of Engineering Work for Persons registered in a Category contemplated in Section 18(1) of the Engineering Profession Act, 2000, (Act No. 46 of 2000)

I, …. , Minister of Public Works, in terms of Section 22(iii) of the Council for the Built Environment Act, 2000 (Act No. 43 of 2000) made the Regulations pertaining to engineering work which has been identified by the Council for the Built Environment in terms of Section 20(2) of the said Act, as set out in the Schedule hereto.

The provisions of this Regulation shall come into operation on the date of publication hereof.

SCHEDULE

1. Definitions

In this Schedule, any word or expression defined in the Act, has that meaning, and unless the context otherwise indicates –

(i) ***"Engineering Council of South Africa"*** *means the Engineering Council of South Africa established by section 2 of the Engineering Profession Act, 2000 (Act No. 46 of 2000), and "ECSA" has the same meaning;*

(ii) ***"Engineering Profession Act"*** *means the Engineering Profession Act, 2000 (Act No. 46 of 2000);*

(iii) ***"engineering discipline"*** *means a generally-recognised, major subdivision of engineering such as the traditional disciplines of Chemical, Civil, or Electrical Engineering, or a cross-disciplinary field of comparable breadth including combinations of engineering fields, for example Mechatronics, and the application of engineering in other fields, for example Bio-Medical Engineering.*

(iv) *"****engineering sub-discipline"*** *means a generally-recognised practice area or major subdivision within an engineering discipline, for example Structural and Geotechnical Engineering within Civil Engineering;*

(iv) ***"engineering work"*** *means the work identified in Annexure 1 of this Schedule;*

(v) *"**improper conduct**" as contemplated in Section 27(1)(3) of the Engineering Profession Act, means conduct which is in contravention of a Code of Conduct or any Code of Practice prescribed from time to time by –*

(a) *ECSA in terms of Section 27(1) of the Engineering Profession Act; or*

(b) *any professional council in terms of the equivalent provisions of the applicable professions' Acts;*

(vi) ***"practice in a category"** as contemplated in section 18(2) of the Engineering Profession Act, means the regular and consistent performance, by any person, of engineering work, in a manner and at a level which may lead the public to infer that he or she is practising in any particular category of registration mentioned in section 18(1) of the Engineering Profession Act;*

(vii) ***"professional council"** means a council for the professions as defined in section 1(iv) of the Act, but also includes:*

(aa) South African Council for Planners established in terms of the Planning Profession Act, 2002 (Act No 36 of 2002);

(bb) South African Council for Natural Scientific Professions established in terms of the National Scientific Professions Act, 2003 (Act No 27 of 2003); and

(cc) South African Council for Professional and Technical Surveyors established in terms of the Professional and Technical Surveyors' Act, 1984 (Act No 40 of 1984).

(viii) ***"public"** means any person or group of persons who is, or whose environment is, either directly or indirectly affected by any engineering activity, or by a product, outcome or influence of an engineering activity, which may impact on the health, safety and interest of such person or group of persons.*

(ix) ***"substantially practise"** means regularly and consistently carrying out engineering work identified in Annexure 1 of this Schedule, while accruing professional responsibility to a client or an employer for the performance of such functions;*

ix) ***"the Council"** means the Council for the Built Environment* established under section 2 of *the Act*;

(xi) *"**the Act**" means the Council for the Built Environment Act, 2000 (Act No 43 of 2000).*

2. Engineering Work Identified for the Professional Categories of Registered Persons

(1) The *engineering work*, as set out in Annexure 1 of this Schedule, has been identified for persons who are registered with the *Engineering Council of South Africa* in any of the professional categories mentioned in Section 18(1)(a) of the *Engineering Profession Act;*

(2) Unless the context otherwise indicates, nothing contained in this regulation may be construed as implying that persons:

(a) ordinarily referred to as artisans, such as workers skilled in a trade, mechanics, operators or craftsmen,

(b) managing engineering works relating to construction works and mining activities for or on behalf of an enterprise which is classified as *micro* or *very small* enterprise in terms of the Small Business Act of 1996 (Act 102 of 1996);

are required to register in any category mentioned in section 18(1), and section 26(4) of the *Engineering Profession Act* applies in respect of such persons who perform work identified in Annexure 1 of this Schedule.

3. Prohibitions

(1) In terms of section 18(2) and 26(3)(a) of the *Engineering Profession Act,* any person -

(a) who is not registered as a professional in any category of registration mentioned in section 18(1)(a) of the *Engineering Profession Act*, may not perform *engineering work* identified under Regulation 2(1);

(b) who is registered as a candidate in any category mentioned in section 18(1)(b), may, as contemplated in section 18(4) of the *Engineering Profession Act*, not perform *engineering work* identified under regulation 2(1) unless such work is performed under the supervision and control of a person registered in any professional category mentioned in section 18(1)(a) of the *Engineering Profession Act*;

(c) who is not registered as a candidate in a category mentioned in section 18(1)(b) and who does not qualify for registration in a professional category mentioned in section 18(1)(a), may not perform *engineering work* identified under regulation 2(1) unless such work is performed under the supervision and control of a person registered in any professional category mentioned in section 18(1)(a) of the *Engineering Profession Act.*

(2) Notwithstanding any exemption granted in terms of Regulation 7, any person who is registered in a professional category with a *professional council,* and who *substantially practises* in engineering may not continue to practice as such unless he or she is registered in a professional category mentioned in section 18(1)(a) of the *Engineering Profession Act*.

4. Offences

(1) Any person who fails to comply with the provisions of regulation 3(1)(a) or (c) or regulation 3(2) is deemed to have contravened the provisions of sections 18(2) and 26(3)(a) of the *Engineering Profession Act* and is guilty of an offence in terms of section 41(1) of the Act.

5. Improper Conduct in Relation to Work Performed

(1) Subject to Regulation 5(2), any person who is registered in a professional category mentioned in section 18(1)(a) of the *Engineering Profession Act* and who performs, or takes responsibility for the performance of, any one or more of the elements of *engineering work* identified in terms of regulation 2(1) at a level, or within knowledge areas, which his or her education, training and experience have not rendered him or her competent to perform, is guilty of *improper conduct* in terms of section 27(3) of the *Engineering Profession Act* and is subject to disciplinary action in terms of that Act.

(2) The *engineering work,* as set out in Annexure 1 of this Schedule, which is ordinarily performed by persons registered in an appropriate professional category of registration mentioned in Section 18(1)(a) of the Engineering Profession Act, is deemed to fall within the range of characteristics specified for each professional category, as set out in section 6 of Annexure 1 of this Schedule of these Regulations, and any registered person undertaking such work shall, for purposes of any disciplinary action referred to in sub-regulation (1), be deemed to have purported to be competent in performing such work.

(3) Reference to engineering disciplines or subdisciplines in this Schedule may not be construed as implying that persons whose discipline are reflected in the register may not practice in any other discipline in which their education training and experience have specifically rendered them competent.

(4) (a) Any person registered in a candidate category referred to in regulation 3(1)(b), who fails to perform *engineering work* under the supervision and control of a person registered as a professional in any professional category, is guilty of improper conduct in terms of section 27(3) of the *Engineering Profession Act* and is subject to disciplinary action in terms of that Act**;**

(b) Any person registered in a candidate category referred to in Regulation 7(2), who fails to comply with the condition contained in that regulation is deemed to be guilty of improper conduct as prescribed by the relevant Council and is subject to disciplinary action by that Council in terms of its Act.

(5) Notwithstanding any exemption granted in Regulation 7(1); any person who is registered with a professional council mentioned in Regulation 7(1) and who regularly performs, or takes responsibility for the performance of, any one or more of the elements of the *engineering work* for which his or her education, training, experience and contextual knowledge have not specifically rendered him or her competent to perform, is deemed to be guilty of *improper conduct* and is subject to disciplinary action by such professional council with whom he or she is registered.

6. Application of this Regulation

(1) This regulation applies in respect of –

(a) any *engineering work* performed within the borders of the RSA, whether or not the intended outcome of such work is to be executed outside the RSA;

(b) any person who is not ordinarily resident in the Republic of South Africa, but who performs *engineering work* within the borders of the RSA.

(c) any engineering system, product, component or commodity that have been designed, manufactured or produced outside the borders of the RSA, and which are incorporated, installed or executed in an engineering related project, to the extent that the person who undertakes such work inside the RSA must be registered in an appropriate professional category mentioned in section 18(1)(a) of the *Engineering Profession* Act and must take responsibility for the work so performed.

(2) These regulations also apply in respect of any person who is in possession of any one or more of the Government Certificates of Competency mentioned in sub-regulation 6(3), and if, from the time of coming into operation of these regulations, such person –

(a) does not hold a statutory appointment in terms of the Mines Health and Safety Act 1996, the Occupational Health and Safety Act 1993 or the Merchant Shipping Act 1951, but performs engineering work for which the relevant certificate of competency is required in terms of such Acts, must register as a professional in the relevant category of registration mentioned in section 18(1)(a) of the Engineering Profession Act; or

(b) holds a statutory appointment in terms of the Mines Health and Safety Act 1996, the Occupational Health and Safety Act 1993 or the Merchant Shipping Act 1951, and performs engineering work for which the relevant certificate of competency is required, must register as a professional certificated engineer mentioned in section 18(1)(a)(iii) of the Engineering Profession Act.

(3) The Government Certificates of Competency, which should not be of limited scope, referred to in regulation 6(2) are:

(a) Electrical Engineer's Certificate of Competency issued in terms of the Mine Health and Safety Act, 1996;

(b) Mechanical Engineer's Certificate of Competency issued in terms of the Mine Health and Safety Act, 1996;

(c) Electrical Engineer's Certificate of Competency issued in terms of the Occupational Health and Safety Act, 1993;

(d) Mechanical Engineer's Certificate of Competency issued in terms of the Occupational Health and Safety Act, 1993;

(e) Manager's Certificate of Competency (Metalliferous) issued in terms of the Mine Health and Safety Act, 1996;

(f) Manager's Certificate of Competency (Coal) issued in terms of Mine Health and Safety Act, 1996; and

(g) Chief Engineer Officer – Foreign Going Certificate of Competency issued in terms of the Merchant Shipping Act, 1951.

7. Exemptions

(1) Notwithstanding the provisions of regulation 2, and subject to regulation 3(2), the following persons may, in the course of practising their profession, perform such elements of *engineering work* identified in terms of regulation 2(1), provided that their education, training**,** experience and contextual knowledge have specifically rendered them competent to perform such work:

Persons registered with the -

(a) South African Council for the Architectural Profession in terms of the Architectural Profession Act, 2000 *(Act No 44 of 2000)*;

(b) South African Council for the Landscape Architectural Profession in terms of the Landscape Architectural Profession Act, 2000 *(Act No 45 of 2000);*

(c) South African Council for the Property Valuers Profession in terms of the Property Valuers Profession Act, 2000 *(Act No 47of 2000)*;

(d) South African Council for the Project and Construction Management Professions in terms of the Project and Construction Management Professions Act, 2000 (Act No 48 of 2000);

(e) South African Council for the Quantity Surveying Profession in terms of the Quantity Surveying Profession Act, 2000 (Act No 49 of 2000);

(f) South African Council for Planners in terms of the Planning Profession Act, 2002 *(Act No 36 of 2002)*;

(g) South African Council for Natural Scientific Professions in terms of the National Scientific Professions Act, 2003 *(Act No 27 of 2003)*; and

(h) South African Council for Professional and Technical Surveyors in terms of the Professional and Technical Surveyors' Act, 1984 *(Act No 40 of 1984)*.

(2) The provisions of regulation 7 (1) also apply in respect of a person who is registered as a candidate in terms of the relevant Act: Provided that such functions are performed under the direction, control and direct supervision of a person registered as a professional in terms of the same Act.

8. Engineering Work identified for Specified Categories

(1) Any Rule, in terms of which engineering work is identified by ECSA, in respect of a specified category of registration contemplated in section 18(1)(c) of the *Engineering Profession Act*, is deemed to be incorporated in this Regulation and the work so identified must be interpreted as augmenting or refining, as the case may be, the *engineering work* identified in Annexure 1 of this Schedule.

(2) Any engineering work which, on the authority of legislation other than the Engineering Profession Act or the Council for the Built Environment Act, requires the person who performs such work, or who takes responsibility for the performance of such work, to be registered in terms of the Engineering Profession Act, is deemed to augment or refine, as the case may be, the engineering work identified in Annexure 1 of this Regulation.

9. Transitional Provisions

(1) Any person who is not registered in terms of the *Engineering Profession Act,* and who is required to be registered as a professional in terms of these Regulations must, within 12 months of the date on which this regulation comes into operation, be registered in any of the professional categories mentioned in section 18(1)(a) of the *Engineering Profession Act*.

(2) Any person whose registration in a professional category was cancelled in terms of the Engineering Profession Act within one year prior to the date on which these regulations commence, must be re-registered in a professional category within six months from the date on which these regulations commence, unless he or she is not required to be so registered in terms of these regulations.

(3) Any person contemplated in Regulation 6(2)(b) must, within a period of 24 months from the date on which this Regulation comes into operation, be registered as a Professional Certificated Engineer in terms of section 19(2)(a) of the Engineering Profession Act.

ANNEXURE 1

Engineering Work and Engineering Functions identified for Professional Categories of Persons Registered with ECSA

1. Background to Identification of Engineering Work

(1) Engineering is an activity that is essential to meeting the needs of people, economic development and the provision of services to society. Engineering involves the purposeful application of mathematical and natural sciences and a body of engineering knowledge, technology and techniques. Engineering seeks to produce solutions whose effects are predicted to the greatest degree possible in often uncertain contexts. While bringing benefits, engineering activity has potential adverse consequences. Engineering therefore must be carried out responsibly and ethically, use available resources efficiently, be economic, safeguard health and safety, be environmentally sound and sustainable and generally manage risks throughout the entire lifecycle of a system.

(2) Engineering is an essential enabler of one or more of the following operations:

(i) Exploitation of natural resources
(ii) Harnessing of energy for useful purposes
(iii) Use of materials and substances with useful chemical or physical properties
(iv) Use of machinery and equipment
(v) Transfer, storage and processing of information
(vi) Construction, maintenance, refurbishment and deconstruction of buildings and engineering infrastructure, and
(vii) Organisation and control of systems or processes
(viii) Education and training of engineering practitioners

Each of these operations brings benefits to people but is also accompanied by potential harm to the health and safety of people and to the environment requiring that such negative impacts be mitigated.

(3) Engineering finds broad application and is therefore organized by division of roles into categories, disciplines and subdisciplines. Engineering has a set of core competencies which are practiced across a number of engineering roles at different levels of demand. Differentiation of level allows the key attributes of the *professional categories* to be defined in sections 4 and 6 of this Annexure for Professional Engineer, Professional Engineering Technologist, Professional Engineering Technician and Professional Certificated Engineer.

(4) Within the broad field of engineering, different bodies of specialist knowledge and areas of application are described as engineering disciplines or subdisciplines. Groups of engineering disciplines and subdisciplines have common bodies of fundamental knowledge. ECSA currently supports 9 broad engineering disciplines:

(i) Aerospace/Aeronautical
(ii) Agricultural
(iii) Chemical
(iv) Civil
(v) Electrical/Electronic
(vi) Industrial

(vii) Mechanical
(viii) Metallurgical
(ix) Mining

A common set of core competencies is required across the established and emerging disciplines and subdisciplines.

ECSA may publish rules from time to time to recognize new disciplines, sub-disciplines cross-disciplinary fields. ECSA may also publish codes of practice for particular practice areas.

2. Definitions

In this Annexure, the expressions defined below have the meaning shown.

"***Engineering science***" means a body of knowledge, based on the natural sciences and using a 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 specializations.

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

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

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

(ii) operate engineering works safely and in the manner intended;

(iii) return engineering works, plant and equipment to an acceptable condition by the renewal, replacement or mending of worn, damaged or decayed parts;

(iii) procurement within engineering works or operations

(iv) direct and control engineering processes, systems, commissioning, operation and decommissioning of equipment;

(v) maintain engineering works or equipment in a state in which it can perform its required function;

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

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

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

3 Identified Engineering Work

(1) Engineering work identified for professional categories of persons registered with ECSA is work which -

(a) requires for its performance any of the competencies listed in section 4 of this Schedule; and

(b) falls within any types of engineering work listed in section 5 of this Schedule; and

(c) is particular to a professional category or a combination of categories by requiring one or more of the characteristic levels of performance defined in section 6 of this schedule.

4. Engineering Competencies

The engineering professional competencies are:-

(1) Define, investigate and analyse *engineering problems* **at the category level**;

(2) Design or develop solutions to *engineering problems* **at the category level;**

(3) Comprehend and apply **category level** knowledge based on engineering sciences underpinning good engineering practice, specialist knowledge and knowledge specific to the jurisdiction and local conditions;

(4) Manage part or all of one or more engineering activities;

(5) Recognise and address the reasonably foreseeable social, cultural, economic, health and safety and environmental effects and risks of engineering activities performed at **the category level;**

(6) Meet all legal and regulatory requirements and protect the health and safety of persons and the environment in the course of his or her engineering activities performed at **the category level;**

(7) Conduct his or her engineering activities ethically;

(8) Exercise sound judgement in the course of engineering activities performed at **the category level;**

(9) Be responsible for making decisions on part or all of engineering activities performed at **the category level;**

(10) Communicate clearly with others in the course of his or her engineering activities.

The minimum levels of performance for each category are listed in section 6.

5. Types of engineering work

Types of engineering work are:

(1) Types of work associated with engineering disciplines:

(a) Aeronautical Engineering: The design, development, operation and maintenance of aircraft and spacecraft of all types based on engineering sciences underlying flight dynamics, aerospace structures and propulsion systems.

(b) Agricultural Engineering: The planning design, development, operation and maintenance of agricultural machinery, mechanisation, production and processing, and natural resource management through the application of engineering sciences.

(c) Chemical Engineering: The planning design, development, operation and maintenance of industrial-scale processes to convert raw and recycled materials to products through chemical and physical processes and engineering sciences: thermodynamics, fluid mechanics, transfer processes.

(d) Civil Engineering: The planning, design, construction, operation and maintenance of all types of structures for buildings, dams, bridges; roads, highways, railways, transportation systems; township services earthworks, excavations soil conservation and geotechnical processes; water resources, pipelines, canals, water treatment, stormwater and drainage, and supply, sewerage systems; sanitation waste disposal coastal engineering.

(e) Electrical Engineering: The planning, design, construction, operation and maintenance of materials, components, plant and systems for generating, transmitting, distributing and utilising electrical energy; electronic devices, apparatus and control systems for industrial systems, bio-medical and consumer products; computing, communication and software for critical applications instrumentation and control of processes, through the application of electrical, electromagnetic and information engineering sciences.

(f) Industrial Engineering: The planning, design, construction, operation and maintenance of industrial, manufacturing and production systems and operations, through systems engineering and supply chain management.

(g) Mechanical Engineering: The planning, design, construction, operation and maintenance of materials, components, machines plant and systems for lifting, hoisting and materials handling; turbines, pumps and fluid power; heating, cooling, ventilating and airconditioning; fuels, combustion, engines, steam plant , turbines; automobiles, trucks and special vehicles; fire protection; nuclear energy generation; through the application of engineering sciences: mechanics, solid mechanics, thermodynamics, fluid mechanics.

(h) Metallurgical and Materials Engineering including:

(i) Physical Metallurgy: The analysis, design, production, characterisation, failure analysis and application of materials, including metals, for engineering applications based on an understanding of the properties of matter and engineering requirements.

(ii) Extractive Metallurgical Engineering: The planning, design, construction, operation and maintenance of processes for the extraction of metals or intermediate compounds from ores by chemical or physical processes, including those at high temperatures.

(i) Mining Engineering: The planning, design, development, operation, maintenance and rehabilitation of works for the extraction of minerals from natural deposits on the earth's surface, underground or under water.

(j) Combinations of the above disciplines.

(2) Types of engineering work associated with areas of engineering application or activity:

(a) The analysis, design and planning and operation of measures and processes to improve air, water, or land resources, to supply clean water, to improve air quality and to remediate land degradation and pollution, based on engineering sciences.

(b) Application of the disciplines listed in 1 above in other areas, including but not restricted to Biomedical Engineering.

(c) Transportation systems including roads, railways, waterways, ports, harbours, airports, gas transmission and distribution systems, pipelines, and all associated works such as yards, docks, lighthouses, rolling stock, vessels, aircraft, lifts, hoists and escalators and pumping plant.

(d) Works for the harnessing of energy including that derived from fossil fuel combustion, nuclear fission or fusion and solar radiation and other renewable sources, yielding energy suitable for commercial application.

(e) Process systems including chemical works, metallurgical works, manufacturing, food processing such as that in concentrator machinery and apparatus, oil and gas wells, smelters, cyanide plants, acid plants, metallurgical machinery, equipment and apparatus, and works necessary for the beneficiation of metals, minerals, rocks, petroleum and organic substances or other chemical processes.

(f) The mechanical, electrical, chemical, electrochemical, metallurgical, biological or heat treatment of any substance, whether biological, organic or inorganic, and combinations thereof for any purpose.

(g) Building services such as water supply, drainage, fire protection measures, electrical and electronic systems, foundations, support frameworks and water supply.

(h) Application of the results of research and development, and the engineering contribution to the commercialisation of projects and products;

(i) Overseeing the planning, design and delivery of education and training programmes accredited by ECSA and assessment of students at the exit level.

(j) The mentoring of persons in their preparation for professional registration with ECSA.

(3) Situations with particular risks that require mitigation:-

(a) Exploitation of natural resources, including mineral and bio-resources;

(b) Protection against of natural forces including wind, flood, tides, rain, hail, and lightning;

(c) Supporting static and dynamic loads;

(d) Storing energy;

(e) Use of materials and substances with possibly harmful physical or chemical properties;

(f) Use of machinery and equipment;

(g) Use of substances at high or low temperature or pressure;

(h) Systems with dynamical behavior with or without controllers;

(i) Transfer, storage and processing of critical information.

6. Characteristic Level of Competencies for Professional Categories

The minimum level of performance for the categories shown are characterized by one or more of the attributes under (a), (b), (c) or (d):-		
(1) Professional Engineer	**(2) Professional Engineering Technologist (with additional requirements for** **(3) Certificated Engineer shown in (d)(ii)**	**(4) Professional Engineering Technician**
(a) For the analysis and solution of engineering problems, problems:-		
i. are ill-posed or over-determined	i. are ill-posed or over-determined	i. are defined in detail
ii. encompass entire systems or subsystems within a system or project	ii. are located within an engineering system or project	ii. are well defined tasks, within an engineering operation or project
iii. requires a fundamentals-based analysis and the use of modelling	iii. belong to families of problems amenable to solution by established technologies	iii. can be addressed by established techniques or prescribed procedures
iv. rely on information from multiple sources that may be abstract or incomplete	iv. rely on information from sources that interface with the practice area which may be incomplete	iv. rely on information that is largely complete and concrete
v. have no obvious solution and require original analysis	v. are amenable to solution by structured analysis	v. can be solved by established methods
vi. involve diverse, seldom encountered or conflicting technical and other issues	vi. involve a number of factors that may impose conflicting constraints	vi. are routine and frequently encountered, possibly in unfamiliar contexts
vii. may be outside the compass of standards and codes	vii. may be partly outside standards and codes	vii. solutions are constrained by standards, codes or defined procedures
(b) Knowledge to be applied has the following characteristics:-		
i. advanced knowledge of widely-applied engineering principles underpinning good practice and knowledge specific to the jurisdiction;	i. knowledge embodied in widely accepted procedures, processes, systems or methodologies and knowledge that is specific to the jurisdiction;	i. knowledge embodied in established engineering practices and knowledge specific to the jurisdiction;
ii. in-depth fundamental and specialist knowledge in practice area that allows a fundamentals-based, first-principles analytical, approach building models as required;	ii. in-depth knowledge of technologies applied and the engineering sciences underlying these technologies	ii. knowledge of the application of principles underlying the methods used;
iii. as required for practice area, a selection of: law of contract, Health and Safety, Environmental, IPR, contract administration, quality management, risk management maintenance management,	iii. as required for practice area, have a selection of: law of contract, Health and Safety, intellectual property, Environmental, contract administration, quality management, hazard & operability study,	iii. practical knowledge in applicable law, regulation, codes, quality systems, project management procedures, construction management, maintenance procedures, maintenance

regulation, project & construction management iv. a working knowledge of interacting disciplines (engineering and other)	project management, maintenance management, project & construction management. iv. have a working knowledge of interacting disciplines/technologies	management. iv. have a working knowledge in disciplines immediately related to the practice area

(c) For the assessment of impact and risks and compliance with legislation and ethical behaviour		
i. wide range of interested and affected parties with widely varying need; ii. have significant potential consequences in a range of contexts; iii. judgment in decision making requires diverse factors and missing information to be taken into account.	i. several groups of interested and affected parties with differing and occasionally conflicting needs; ii. have significant consequences which are important in practice, but may extend more widely; iii. judgment in decision making, in practice area, considering interactions other areas.	i. limited range of interested and affected parties with differing needs; ii. consequences of are locally important but not far reaching. iii. judgement on the validity of solutions produced by the techniques used
(d) Work is subject to legislation outside the Engineering Professions Act		
i. Any statutory duty that is defined for a Professional Engineer in other legislation.	i. Any statutory duty that is defined for a Professional Engineering Technologist in other legislation. ii. For the case of the Professional Certificated Engineer: Any work that is subject to the Occupational Health and Safety Act 1993, the Mine Health and Safety Act 1996, and the Merchant Shipping Act, 1951	iii. Any statutory duty that is defined for a Professional Engineering Technician in other legislation.

ANNEXURE 2

ENGINEERING COUNCIL OF SOUTH AFRICA

Guidelines: Characteristics of Engineering Work ordinarily performed by Professional Categories of Registration

1. Introduction and Scope

The Regulations governing the identification of engineering work which are to be issued by the Minister of Public Works in terms of the Council for the Built Environment Act, 2000, are framed around the identification of engineering work[s] for persons who are registered in a category mentioned in section 18(1) of the Engineering Profession Act, 2000. **Annexure 1** of these Regulations is generic by nature and identifies the engineering competencies (section 4) and the types of engineering works section 5). Minimum levels of performance for the various competencies are specified in section 6 of Annexure 1 for each professional category.

(a) professional engineer (section 6.1);

(b) professional engineering technologist (section (6.2);

(c) professional certificated engineer (section 6.2); and

(d) professional engineering technician (section 6.3)

These guidelines should be read in conjunction with Regulation 5(1) and (2) as well as **Annexure 1** of these Regulations prescribed by the Minister of Public Works …….. which read as follows:

"5. Improper Conduct

(1) Subject to Regulation 5(2), any person who is registered in a professional category mentioned in section 18(1)(a) of the Engineering Profession Act and who performs, or takes responsibility for the performance of, any one or more of the elements of engineering work identified in terms of regulation 2(1) at a level, or within the knowledge areas, which his or her education, training and experience have not rendered him or her competent to perform, is guilty of improper conduct in terms of section 27(3) of the Engineering Profession Act and is subject to disciplinary action in terms of that Act.

(2) The engineering work, as set out in Annexure 1 of this Schedule, which is ordinarily performed by persons registered in an appropriate professional category of registration mentioned in Section 18(1)(a) of the Engineering Profession Act, is deemed to fall within the range of characteristics specified for each professional category, as set out Annexure 2 of this Schedule, and any registered person undertaking such work shall, for purposes of any disciplinary action referred to in sub-regulation (1), be deemed to have purported to be competent in performing such work."

Regulation 5(1) reinforces a fundamental principle contained in the Code of Professional Conduct, namely that registered persons may not perform engineering work for which their education, training and experience have not rendered them competent to perform.

Regulation 5(2) contextualises Annexure 1 (identified engineering work) in relation to these guidelines, and specifically the generic characteristics of work generally performed by any one of the four professional categories of registration. The sub-regulation also establishes a (refutable) presumption that a person who actually performs identified engineering work is purporting to be competent in performing such work.

In the event that a person is found to have exceeded the boundaries of his or her competence, by performing engineering work that are normally associated with professionals registered in another category, or in a different discipline, such person is subject to disciplinary action by the Council.

2. Requirements

The provisions of Regulation 5(1) and (2) are deemed to be satisfied where a person registered in an appropriate professional category performs and takes responsibility for engineering work which have the characteristics commensurate with his or her particular category of registration, as set out in the sections 3, 4 and 5 of Annexure 1, read with:

(a) section 6.1 in the case of the professional engineer category;

(b) section 6.2 in the case of the professional engineering technologist;

(c) section 6.2 in the case of the professional certificated engineer; and

(d) section 6.3 in the case of the professional engineering technician.

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Non-compliance with Regulation 5(1) and (2) constitutes improper conduct.

ENGINEERING COUNCIL OF SOUTH AFRICA

IDENTIFICATION OF ENGINEERING WORK STEERING COMMITTEE

An overview of the proposed Regulations for the Identification of Engineering Work

1 *Purpose of work identification in the RSA*

The main purpose of work identification in South Africa is to ensure that work peculiar to the built environment is performed only by competent persons who are registered with a statutory council and who are accountable for their actions, in a manner that is consistent with government's competition policy, which protects the health and safety of the public and the environment and provides recourse in relation to aspects of professional conduct.

2 *Regulatory Backdrop to the Identification of Work*

2.1 Section 20 of the Council for the Built Environment Act, 2000 (Act No 43 of 2000) requires the Council for the Built Environment to identify the scope of work for every category of registered persons after receipt of the recommendations of the councils for professions prepared in terms of their respective acts. Thereafter, a person who is not registered by the Engineering Council of South Africa (ECSA) may not perform any engineering work identified for any category provided for in the Engineering Profession Act, 2000 (Act No 46 of 2000).

2.2 Section 26(1) of the Engineering Profession Act, 2000 (Act No 46 of 2000) requires Engineering Council of South Africa (ECSA) to consult with recognized voluntary associations, persons, bodies and industries that may be affected by any laws regulating the built environment professions regarding the identification of the type of engineering work which may be performed by persons registered in any categories provided for in section 18 of the Engineering Profession Act, including work which may fall into the scope of any other profession regulated by the respective professions' act referred to in the Council for the Built Environment Act, 2000 (Act No 43 of 2000).

2.3 Section 26(2) of the Council of the Built Environment Act, 2000 (Act No 46 of 2000) requires Engineering Council of South Africa to submit recommendations to the Council for the Built Environment following such consultation.

2.4 In terms of section 26.(3) of the Engineering Profession Act, 2000 (Act No 46 of 2000), candidates and persons who are not registered may not perform work identified for registered persons unless they do so under the direct supervision and control of a person registered in the appropriate professional or specified category.

2.5 Section 27 of the Engineering Profession Act, 2000 (Act No 46 of 2000), empowers the Engineering Council of South Africa to draw up a code of conduct for registered persons and to draw up codes-of-practice.

3 *The thinking behind the proposals for the Identification of Engineering Work for persons registered in terms of the Engineering Profession Act*

The proposals for the Identification of Engineering Work are based on the following premises:

3.1 Engineering work identified for the professional categories of registration should be generic in nature. No attempt should be made to establish boundaries between disciplines and sub-disciplines within engineering work. The approach should rather be to establish the boundary between work identified for engineering professionals and those who are not. Reliance should be placed on codes of conduct and codes of practice to determine what work within the identified work such professionals may undertake that is commensurate with their education, training, experience and contextual knowledge.

3.2 Engineering work may be identified by considering whether or not work falls within a listing of broad types of work, involves general characteristics in its execution, requires certain functions to be performed and requires minimum competencies for its execution. Engineering work is work where an affirmative answer is obtained in all of the aforementioned descriptors.

3.3 Artisans such as workers skilled in a trade, mechanics, operators and craftsmen and managers of very small and micro enterprises involved in construction works and mining activities are exempt from the need to be registered.

3.4 Persons registered within a particular category of professional registration may perform work within a range of characteristics identified for each category of registration. They may perform work within the range of another category should they deem themselves competent to do so by virtue of their education, training, experience and contextual knowledge.

3.5 There will always be overlaps between the different professions. Instead of trying to resolve the boundaries between professions, persons who are professionally registered with statutory councils other than Engineering Council of South Africa should be allowed to perform any work which falls within the overlaps provided that their education, training, experience and contextual knowledge have rendered them competent to perform such work. However, where such persons regularly and consistently perform engineering work and take responsibility for such work, such persons must become registered with Engineering Council of South Africa.

3.6 The specified category provided for by section 18.(1)(c) of the Engineering Profession Act, 2000 (Act No 46 of 2000), may be used to allow persons who are not able to register in the professional categories to perform aspects of engineering work identified for registered persons. In exceptional cases, it may be used to address discipline specific or specialist areas of engineering work performed by those registered in the professional categories. This, however, introduces dual registration and necessitates that the work performed by persons be separately identified in the Regulations.

3.7 Foreign engineers performing identified engineering work without supervision in South Africa and who takes responsibility for such work, must become registered with the Engineering Council of South Africa.

3.8 Codes of practice issued by the Engineering Council of South Africa in terms of Section 27 of the Engineering Profession Act, 2000 (Act No 46 of 2000), may be used to set standards of acceptable professional practice, to provide clarity and substance to a range of issues relating to discipline specific work or work within specific areas and to clarify the overlaps between categories of registered persons.

3.9 It is implied in the regulations that the time period for becoming registered is reasonable and is the same for all practice areas so that no person is prejudiced by the registration process.

4 *Engineering Council of South Africa's Identification of Engineering Work Project*

Engineering Council of South Africa established an Identification of Engineering Work Steering Committee to develop proposals for the identification of engineering work. This committee has proposed regulations for the identification of engineering work for promulgation in terms of the Council for the Built Environment Act, 2000 (Act No 43 of 2000). Engineering Council of South Africa has forwarded these proposed regulations together with an explanatory memorandum as its recommendations to the Council for the Built Environment (see www.ecsa.co.za).

5 *What Constitutes engineering work?*

Engineering work is work which, in terms of the proposed regulations and with respect to Table 1, involves in its execution one or more identified characteristics (column 1), falls within the scope of listed types of work (column 2), requires for its performance any of a number of identified functions (column 3) and minimum levels of competencies (column 4). Work which falls within the identified types of work and does not in its execution have at least one of the identified characteristics, require any of the identified function or require the stated competencies does not constitute engineering work.

Extract from Table 1: What constitutes engineering work

1	2	3	4
Characteristics	**Types of work**	**Functions**	**Competencies**
Involves one or more of the following: • investigation and solving of problems and design solutions; • application of knowledge and engineering technology, based on mathematics, basic sciences and engineering sciences, information technology as well as specialist and contextual knowledge; • management of engineering works; • the addressing of the impacts of engineering work; or • the exercising of judgment and the taking of responsibility for engineering work.	Falls within the scope of the following: • transportation systems • civil works • structural works • mechanical systems • works for the harnessing of energy • electrical power systems • electronic systems • process systems • mining operations or activities • treatment of any substances • building services • lightning protection measures. • overseeing ECSA accredited programmes at the exit level. • mentoring of candidate engineering practitioners.	Requires in its performance any of the following: • design • planning • investigating, advising, costing, reporting and auditing • improvement or optimisation; • management, procurement and maintenance • implementation; • application of the results of research and development • management of risk; • communication of the impacts and outcomes; and • education, training and mentoring of engineering personnel	Requires in its performance minimum competencies relating to the: • definition, investigation and analysis of engineering problems • design or development of solutions to engineering problems • conduct of engineering activities in an ethical manner

NOTES:

1. The full text of what constitutes identified engineering work, can be accessed on the Engineering Council of South Africa Website (see www.ecsa.co.za).

2. Other relevant Identification of Engineering Work-related supportive documents are also available on the Engineering Council of South Africa website.

6 *What happens after the Minister promulgates the IDoEW regulations*

No persons shall, after the transitional period set in the regulations by the Minister, be permitted to perform and take responsibility for such identified engineering work in South Africa, unless they are registered in the appropriate category with Engineering Council of South Africa or perform such work under the direction, control and supervision of a registered person. Persons who are professionally registered with other statutory bodies may in the course of practicing their profession, perform and take responsibility for such identified engineering work provided that their education, training, experience and contextual knowledge have specifically render them competent to perform such work.

Complex Engineering Work

Complex engineering work means work activities that require a practitioner with a minimum of the Stage 2 Engineer competencies to effectively perform that work.

Each engineer, by the time of reaching the point of assessment against this standard, will have followed a programme of education, training and experience that may conform to an established pattern or may be distinctive. Each individual therefore develops an area of knowledge and expertise that may be distinctive. This pattern of knowledge and expertise is termed the individual's *practice area*.

Complex Engineering Activities: are characterized by several or all of the following:

- *Activities* involve one or more of: design; planning; investigation and problem resolution; improvement of materials, components, systems or processes; engineering operations; project management; research, development and commercialisation;
- *Boundaries* of practice area change over time, formulate new engineering principles, new procedures, standards or codes, or advancing engineering practice;
- *Context* is complex and varying, is multidisciplinary, requires teamwork, may be unpredictable and may need to be identified;
- Involve the use of diverse *resources* (including people, money, equipment, materials, and technologies), high risk or resource intensive projects;
- Require resolution of significant problems arising from *interactions* between wide-ranging or conflicting technical, engineering or other issues, and
- Are *constrained* by time, finance, infrastructure, resources, facilities, standards & codes, applicable laws.

Complex Engineering Problems are characterized by several or all of the following:

- Requires a fundamental and specialist underpinning knowledge;
- May encompass entire complex engineering systems or complex subsystems;
- Ill posed, unpredictable, under- or over specified problems, requiring identification and refinement;
- Information from variety of sources is complex, abstract and possibly incomplete & requires analysis, abstraction, structuring and evaluation;
- Have no obvious solution and require originality and analysis;
- Involves wide-ranging or conflicting technical, engineering and other issues
- Involve infrequently encountered issues;
- Problems may be outside those encompassed by standards and codes; operate outside where justified;
- Involves wide ranges of interested and affected parties with widely varying need;
- Have significant consequences in a range of contexts, and
- Requires judgment in decision making taking diverse factors into account.

Knowledge:

- Requires in-depth specialist knowledge in practice area that allows a fundamentals-based, first principles analytical, approach building models as required;
- As required for practice area, a selection of: law of contract, Health and Safety, Environmental, IPR, contract administration, quality management, risk management maintenance management, regulation, project & construction management, and
- Working knowledge of interacting disciplines (engineering and other) to underpin teamwork.

Broadly defined Engineering Work

Broadly defined engineering work means work activities that require a practitioner with a minimum of the Stage 2 Engineering Technologist competencies to effectively perform that work.

Each engineering technologist, by the time of reaching the point of assessment against this standard, will have followed a programme of education, training and experience that may conform to an established pattern or may be distinctive. Each individual therefore develops an area of knowledge and expertise that may be distinctive. This pattern of knowledge and expertise is termed the individual's *practice area*.

Broadly-defined Engineering Activities: are characterized by several or all of:

- *Activities* involve one or more of: design; planning; investigation and problem resolution; improvement of materials, components, systems or processes; engineering operations; project management; research, development and commercialisation;
- *Boundaries* of practice area linked to technologies used, change by adoption of new technology into current practice;
- Practice area is located within a wider, complex *context*, requires teamwork, has interfaces to other parties and disciplines;
- Involve the use a variety *resources* (including people, money, equipment, materials, technologies), dealing with risks in practice area;
- Require resolution of occasional problems arising from *interactions* between wide-ranging or conflicting technical, engineering or other issues, and
- *Constrained* by available technology time, finance, infrastructure, resources, facilities, standards & codes, applicable laws.

Broadly-defined Engineering Problem: are characterized by several or all of:

- Requires underpinning knowledge and skills in the technology area;
- May encompass systems within complex engineering systems;
- Ill posed, under or over specified problems requiring identification and interpretation into practice area;
- Information from sources interfacing with practice area is complex and possibly incomplete, requires analysis and compilation into information base;
- Can be solved by structured analysis techniques;
- Involves a variety of factors which may impose conflicting constraints;
- Belong to families of problems which are solved in well-accepted and innovative ways;
- Problems may be partially outside standards and codes; operate outside with justification;
- Involves several groups of interested and affected parties with differing and occasionally conflicting needs;
- Have significant consequences which are important in practice, but may extend more widely, and
- Requires judgment in decision making, in practice area, considering interfaces to other areas.

Knowledge:

- As required for practice area, a selection of: law of contract, Health and Safety, intellectual property, Environmental, contract administration, quality management, hazard & operability study, project management, maintenance management, project & construction management;
- Working knowledge of interacting disciplines/technologies (engineering and other) to underpin teamwork;
- Experience of a range of broadly-defined engineering activities in the practice area, and
- Understanding and acceptance of taking responsibility within broad parameters and functions and behaving ethically.

Well defined Engineering Work

Well defined engineering work means work activities that require a practitioner with a minimum of the Stage 2 Engineering Technician competencies to effectively perform that work.

Each engineering technician, by the time of reaching the point of assessment against this standard, will have followed a programme of education, training and experience that may conform to an established pattern or may be distinctive. Each individual therefore develops an area of knowledge and expertise that may be distinctive. This pattern of knowledge and expertise is termed the individual's *practice area*.

Well defined Engineering Activities: are characterized by:

- Contribute to one or more of: design; planning; investigation and problem resolution; improvement of materials, components, systems or processes; engineering operations; project management; project implementation; research, development and commercialisation;
- *Boundaries* of practice area defined by techniques applied; change by adopting new techniques into current practice; Opportunities to improve practise are referred to engineers or technologists or relevant stakeholders;
- Practice area is located within a wider, complex *context*, with well defined working relationships with other parties and disciplines;
- Work involves familiar, defined range of *resources* (including people, money, equipment, materials, technologies), risks are well defined;
- Require resolution of *interactions* manifested between specific technical factors with limited impact on wider issues, and
- *Constrained* by operational context, defined workpackage, time, finance, infrastructure, resources, facilities, standards & codes, applicable Laws.

Well defined Engineering Problems: are characterized by:

- Are discrete, focussed tasks within engineering systems;
- Problems are routine, may be unfamiliar but in familiar context; problem definitions require clarification;
- Information is concrete and largely complete, but requires checking and possible supplementation;
- Can be solved in standardized or prescribed ways;
- Involve several issues but with few of these imposing conflicting constraints;
- Are frequently encountered and thus familiar to most persons in the practice area;
- Problems are encompasses by standards, codes and documented procedures; only work outside their prescriptions with authorisation;
- Involve a limited range of interested and affected parties with differing needs;
- Have consequences which are locally important but not far reaching, and
- Requires practical judgment in practice area in evaluating solutions, considering interfaces to other role players.

Knowledge:

- Selection of: practical knowledge in applicable law, regulation, codes, quality systems, project management procedures, construction management, maintenance procedures, maintenance management;
- Working knowledge in disciplines requesting work and receiving outputs relating to pivotal contribution of techniques to the system (rather than detailed design), and
- Experience of a range of well-defined engineering activities in the practice area.

Professional Engineers

POLICY STATEMENT R2/1A

Acceptable Engineering Work for Candidate Engineers for Registration as Professional Engineers

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E C S A

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C O N T E N T S

SECTION 1

EXECUTIVE SUMMARY

The Engineering Council of South Africa (ECSA) is responsible, *inter alia*, for the setting of educational and professional development standards with the view to registering persons who apply for registration as professional engineers. A number of factors in the rapidly changing South African environment, such as the new Engineering Profession Act, 2000 (Act No 46 of 2000) and in the wider world of engineering, have prompted ECSA over the past few years to review its standards, policies and procedures relating to registration.

Following the promulgation of the new Engineering Profession Act, the decision was taken to produce separate Policy Statements for each category and in so doing to incorporate the Policy and Procedures documents into the new Policy Statement. This Policy Statement therefore replaces Policy Statement R1/1 for engineers and Policies and Procedures: Training Requirements for Professional Development of Engineers in Training.

This revised Policy Statement should be carefully noted by:

(i) all aspirant professional engineers (whether registered as candidate engineers or not);

(ii) employers offering a commitment and undertaking to provide employees with the training and guidance necessary for candidate engineers to develop the required level of professionalism; and

(iii) all participants in the process.

ECSA is cognisant of significant differences between the nature, content and working environment of the different disciplines of engineering and has adopted a policy for professional development within which the training, appropriate to each discipline and the procedures best suited to evaluating candidate engineers in that discipline, can be defined. The general rule is that candidate engineers for registration must demonstrate their professional development and competence. This requires a procedure for professional assessment by ECSA. It should be noted that standards for registration have not been compromised. Core elements of professional development and specific guidelines for training and documenting progress have been defined for each discipline of engineering. An essential component of ECSA's new approach is to discontinue the process of approval of specific training programmes and to replace it with the registration of a "Commitment and Undertaking" (C&U) submitted by employers.

This will provide flexibility and an opportunity for candidate engineers to structure their training and to develop professionally in accordance with ECSA's minimum requirements. A C&U will only be registered by ECSA if a registered mentor is appointed to guide candidate engineers in the work situation.

In terms of the revised policy, candidate engineers should benefit from their employer's C&U if they provide detailed and structured information on their professional development in accordance with the relevant Discipline Specific Guidelines. Candidate engineers, whose training is not in accordance with the relevant guidelines, will be subjected to a more stringent and detailed professional assessment. There is clearly an incentive to follow the structured route to registration.

Implementation of this revised policy will be responsive to the circumstances in each recognised discipline of engineering. In all disciplines the Professional Review (PR), in the form of a personal interview have been introduced to comply with international requirements. In civil engineering, however, a PR includes an interview, a project presentation by the candidate engineer, as well as a written test in the form of two essays.

SECTION 2

BACKGROUND

The following factors prompted ECSA to review its standards, policies and procedures, and to adopt a new approach in prescribing training requirements and the assessment of applicants:

(a) The National Qualifications Framework (NQF) and the South African Qualifications Authority (SAQA) will have a profound effect on the training of skilled manpower in future. Engineering will probably be one of the professions most affected by government decisions and it is imperative that the engineering profession should be able to adjust to the new circumstances and, more importantly, play a decisive role in influencing government thinking in so far as it relates to standards setting and competency assessment.

(b) In the interest of openness and fair administrative procedure it becomes necessary for ECSA to communicate, in more definitive terms, its policies, standards and procedures so as to enable aspirant professionals to prepare themselves better for their future careers.

(c) Having been admitted as a full member of the Washington Accord (which provides mutual accreditation of undergraduate qualifications at universities), and as a signatory to the Engineers Mobility Forum (which is striving to achieve a system of mutual recognition at the full professional level to facilitate cross-border mobility of registered professional engineers), ECSA's policies, procedures and standards are increasingly coming under scrutiny on a world-wide basis. Since it is one of ECSA's stated objectives, to ensure that its standards should at least meet those of the international community, it is necessary to document its requirements in sufficient detail to facilitate assessment by the international engineering community.

(d) The need has been identified to improve the process of evaluation of applicants without necessarily increasing the standards. Whilst ECSA is still satisfied with its standards, concern has been expressed that ECSA's evaluation process may not be adequately streamlined, or sufficiently comprehensive, to ensure that all persons registered actually meet the requirements in full.

(e) The so called “New Registration System” for engineers, given in the Policies and Procedures issued on 23 May 1996 and the Discipline Specific Guidelines, was introduced for all disciplines except civil from 1January 1997. The new system for civil engineers was introduced from 1 January 1998, as a longer transition period was required to accommodate the differences for civil engineers. Candidate civil engineers have to attend a Professional Review (PR), prepare a 4000-word project report and are required to write two essays under examination conditions after the interview. Since 1 January 2001, the other 8 disciplines are also required to attend a PR.

SECTION 3

INTRODUCTION

3.1 Purpose

The Engineering Profession of South Africa Act, 2000 (Act No. 46 of 2000) requires that applicants who desire to register as professional engineers *inter alia* must satisfy Council that they:

(a) have demonstrated their competence as measured against standards determined by the council for the relevant category of registration; and

(b) have, passed any additional examinations that may be determined by the council.

The purpose of this Policy Statement is to describe the experience and practical training, which will satisfy the requirements determined by the Council in terms of the Act. For the purposes of this Policy Statement, the acceptable work of an engineering nature will generally be referred to as **"practical training"** although far more than training is involved.

It is further intended that this Policy Statement be used by applicants for registration as professional engineers and also by employers when compiling practical training programmes for their candidate engineers.

3.2 Categories registered by Council

The ECSA registers persons in the categories as set out in Table 1:

Table 1 Categories Registered by Council

"Candidate" Categories	Full Professional Categories
Candidate Engineer	Professional Engineer
Candidate Engineering Technologist	Professional Engineering Technologist
Candidate Certificated Engineer	Professional Certificated Engineer
Candidate Engineering Technician	Professional Engineering Technician

This Policy Statement specifically covers the categories of Candidate Engineer and Professional Engineer only. Policy Statements are available for the other categories mentioned in Table 1 and can be obtained from the Council's offices or downloaded from ECSA's website **www.ecsa.co.za.**

3.3 Description of a Professional Engineer

Professional Engineers are concerned primarily with the progress of technology through innovation, creativity and change. Their work involves the application of a significant range of fundamental principles, enabling them to develop and apply new technologies, promote advanced designs and design methods, introduce new and more efficient production techniques, marketing and construction concepts, and pioneer new engineering services and management methods. They may be involved with the management and direction of high risk and resource intensive projects. Professional Engineers undertake and lead varied work that is essentially intellectual in nature, requiring discretion and judgement. Such work has its base in proficiencies and competencies derived from and extended by experience and research. It is concerned with cost effective, timely, reliable, safe, aesthetically pleasing and environmentally sustainable outcomes.

SECTION 4

REGISTRATION AS A CANDIDATE ENGINEER

A person who has passed an accredited programme(s) and/or examination recognised by Council is eligible for registration in the candidate engineer category in terms of the Engineering Profession Act, 2000 (Act No. 46 of 2000).

The recognised or accredited qualifications, or their equivalents, as determined by Council from time to time, are basically BSc (Eng) or B Eng. To enable Council to determine whether or not a foreign or other qualification is equivalent to a recognised qualification, an applicant may be required to attend an interview and/or to sit for an examination. Further details are obtainable from the Council's offices.

Application forms can be obtained from the Council's offices or be downloaded from ECSA's website at **www.ecsa.co.za.**

SECTION 5

ESSENTIAL ELEMENTS OF ACCEPTABLE PRACTICAL TRAINING

Acceptable practical training must provide satisfactory experience to candidate engineers in the application of engineering principles and methods and must include the practical training elements as stated in § 5.1 to § 5.3, at the level of responsibility stated in § 5.4.

5.1 Problem Investigation

The work must be aimed at investigating engineering problems and for which engineering judgement is required. The following practical engineering functions are contained in such work to a greater or lesser degree:

(a) problem identification and formulation;

(b) finding and selecting relevant information;

(c) evaluating, investigating, testing and research;

(d) analysis of all factors that influence the solution like relevant engineering and scientific principles;

5.2 Problem Solution

The work must be aimed at the full development of the suggested solution to the problem through a process of synthesis, with the application of all information acquired during the problem investigation, also using design, development and communication. This includes but is not limited to the drawing up of plans, detailed designs, reports, specifications, adjudication of tenders taking into account all practical, economic, social, environmental, quality assurance, safety and statutory factors.

5.3 Execution / Implementation

The work must be aimed at the execution of engineering tasks or projects (for example construction, manufacturing, transformation, processing, production, commissioning, testing, certification, quality assurance, operation, maintenance and closure) encompassing the efficient utilisation of people, materials, machines, equipment, means and funding with due regard for their interaction, to achieve the end result within the set parameters.

5.4 Responsibility

The work must be aimed at increasing engineering and managerial responsibility until candidate engineers are clearly able to accept professional responsibility for taking engineering decisions. Part of their responsibility should also be to ensure that sufficient cognisance is taken of economic considerations, social circumstances, environmental factors, quality assurance, safety and legal aspects as well as of the code of professional conduct.

Notes:

(i) The degree of responsibility of candidate engineers, as well as their personal and specific involvement with each project, should be clear from the reports which accompany their applications;

(ii) different weights may be awarded to the essential elements of practical training, depending on the requirements of the specific engineering disciplines;

(iii) different composition of the essential practical training elements may be structured in order to evaluate the level of work performed. These could be application of technological knowledge, manipulative skills, thinking skills, communication skills, interpersonal skills and management skills.

SECTION 6

DISCIPLINE SPECIFIC GUIDELINES

6.1 Whilst considerable consensus was reached amongst the various Professional Advisory Committees, it became clear to ECSA that, considering the diverse nature of engineering, recognition should be given to the needs of, and requirements for, each discipline of engineering. The needs of the various engineering disciplines largely dictated the approach, which the respective professional advisory committees wished to adopt in achieving the objectives of this Policy Statement as well as a result appropriate to their particular discipline of engineering.

6.2 In addition to this Policy Statement, ECSA has prepared Discipline Specific Guidelines for each of the main disciplines of engineering recognised by ECSA, namely aeronautical, agricultural, chemical, civil, electrical/electronic, industrial, mechanical, metallurgical and mining engineering.

The Discipline Specific Guidelines are intended to be complementary to this Policy Statement.

6.3 The Discipline Specific Guidelines prepared by the Professional Advisory Committees set out clearly what graduate engineers should do when they start their training after graduation. Reference is made to the responsibilities of graduates and their mentors. The discipline specific requirements are well documented and the guidelines provide instructions as to how graduates should report on their progress and what their mentors should do in assessing their progress.

6.4 It is of utmost importance that candidate engineers should consult the Discipline Specific Guidelines for the particular engineering discipline in which they have received their training, because these documents contain essential details on the type of information, which ECSA requires for registration in any specific discipline of engineering.

6.5 Where employers have engineering graduates in more than one discipline of engineering, they should take careful note of the differences between the various disciplines. The differences revolve mainly around the assessment procedures of applicants for registration.

6.6 Copies of the Discipline Specific Guidelines for engineers are available from ECSA's offices and may also be downloaded from the website at **www.ecsa.co.za**. Copies of these guidelines as well as the appropriate forms will, as a matter of course, be forwarded to all candidate engineers upon registration as such.

SECTION 7

ENGINEERING WORK FOR CANDIDATE ENGINEERS

7.1 Post-Qualification Practical Training Requirements for Registration as a Professional Engineer

In this Policy Statement, **"practical training"** means engineering experience gained after attaining a recognised qualification in engineering and which may be structured or unstructured.

Council requires that prospective applicants for professional registration be trained (including availing themselves of development opportunities), to its satisfaction in the application of engineering principles and methods within their disciplines of engineering, or combination of disciplines, and be given progressively more responsibility until they are capable of accepting professional responsibility in making and executing engineering decisions at the level appropriate to a professional engineer.

Candidate engineers must become aware of the interaction between related disciplines of engineering and the other members of the engineering team, with respect to their own tasks. They must develop the necessary judgement to involve and utilise to the best advantage other members of the engineering team. They should develop the ability to apply a holistic approach to the execution of their tasks.

The prescribed minimum practical training period after obtaining a recognised qualification is three years, as it is not considered possible for candidate engineers to acquire the required range of competencies, and each to the required level, in a shorter period of time. It is anticipated that it will generally take longer than 36 months for a candidate engineer to acquire the necessary competencies. Only candidate engineers with very well developed, managed and implemented training programmes will reach the requirements in the minimum period. Spending time on a particular element of training without a qualitative objective will not in itself ensure achievement of the required level of competency for that element. In the absence of structured training, it is likely that the training required will take longer than the prescribed minimum period.

Council will in judging practical training take into account the following:

(a) nature of practical training (§ 7.2);

(b) standard of practical training (§ 7.3);

(c) variety of practical training (§ 7.4);

Candidate engineers will be expected to also have knowledge of the Code of Conduct (§ 7.5) and to have undertaken Continuing Professional Development (§ 7.6).

Council's policy is also given for candidate engineers to whom the following may be applicable:

(a) recognition of advanced study (§ 7.7);

(b) specialisation (§ 7.8);

(c) lectureship (§ 7.9);

(d) practical training outside the Republic of South Africa (§ 7.10),

7.2 Nature of Practical Training

The practical training must include all the essential elements of practical training stated in Section 5.

The following aspects are pertinent to the "nature of practical training":

(a) The work must essentially be pre-eminently intellectual, of sufficient variety and not of a routine nature;

(b) Candidate engineers must strive to develop the ability to:

  (i) execute a task timeously and correctly, against the background of acquired knowledge and standard procedures/techniques. They must be able to show that a good balance was maintained between the development of innovative concepts or creative ability and the use of standard procedures which simplify their task;

  (ii) maintain a balance between the technical effectiveness of a solution and acceptable costs, within the available timespan;

  (iii) take effective decisions where the technical tools (knowledge, skills and aids) at their disposal are not sufficient to provide obvious solutions;

  (iv) continuously consider the impact of their decisions on social, safety and environmental aspects, taking into account all relevant legislation.

(c) Candidate engineers must keep themselves informed of new technological developments.

7.3 Standard of Practical Training

The standard required is that candidate engineers must increasingly develop the ability to use their theoretical and practical knowledge to an advanced level independently and without constant supervision. They should be capable of innovative planning, design and management. They must be able to provide proof that they can do their work with the necessary intellect, insight and methodical approach applicable to their discipline of engineering.

7.4 Variety of Practical Training

The practical training must consist of a variety of technical tasks, which must include aspects of management, administration, economics, environmental factors, quality assurance, legislation and safety, appropriate to each discipline.

"Variety of technical tasks" is taken to include those activities in a certain recognised discipline of engineering, which pertain to the practical training (problem investigation, problem solving, execution/implementation and the acceptance of responsibility) as further described in Section 5.

Further information regarding the variety of practical training in each discipline of engineering may be obtained from the Discipline Specific Guidelines for each discipline of engineering obtainable from Council and also available on the website at **www.ecsa.co.za**. It is not necessarily expected from candidate engineers that they receive practical training in all the sub-branches of their discipline of engineering.

7.5 Code of Professional Conduct

It is of the utmost importance that candidate engineers, throughout the practical training period, remain aware of, and act according to, the code of professional conduct for the engineering profession as contained in the rules in terms of the Engineering Profession Act, 2000 (Act No. 46 of 2000), a copy of which is obtainable from the Council's offices. The code of conduct will also be forwarded to each person upon registration as a candidate engineer.

7.6 Continuing Professional Development (CPD)

CPD can be defined as "the systematic maintenance, improvement and broadening of knowledge and skills, and the development of personal qualities necessary for the execution of professional and technical duties throughout an engineer's career".

The principle to undertake CPD is included in the Engineering Profession Act, 2000 (Act 46 of 2000). At the time of registration, candidate engineers will be assessed as having the professional competence to enable them to practice safely and effectively in their discipline of engineering. At the Professional Review (PR) candidate engineers will be required to provide evidence of CPD undertaken during their period of post- qualification training and indicate how they intend to meet their obligations to CPD during their professional careers.

Professional Engineers are obliged by the Code of Professional Conduct to undertake CPD, the nature, range and extent of what is required varies with the work to be undertaken. Professional Engineers are required, at all times, to take all reasonable steps to maintain and develop their competence and knowledge in their field of professional activity. Moreover, they must not under any circumstances accept or undertake work which they do not have sufficient competence, time or authority to perform, unless the necessary advice, assistance or authority is obtained.

Any combination of the activities listed below will constitute CPD:

(i) Attending courses, seminars, congresses and technical meetings organized by Engineering Institutions/Institutes, universities, other professional bodies and course providers.

(ii) Actively participating in conferences, serving on technical or professional committees and working groups.

(iii) Undertaking structured self-study (i.e. using textbooks with examples).

(iv) Studying technical literature (e.g. journals, magazines)

(v) Taking correspondence courses and studying other supervised study packages.

(vi) Taking in-house courses provided by employers.

(vii) Enrolling for formal post-graduate studies (limited credits).

(viii) Writing technical papers or presenting lectures at an organized event.

7.7 Recognition of Advanced Study

The prescribed minimum period (see § 7.1) for practical training takes effect after attainment of the entry level qualification recognised by Council. (See Section 4).

Recognition of up to 12 months may be considered in respect of advanced study and then only if the nature of the work and the level of responsibility was the same as can be expected from a **c**andidate engineer being trained in accordance with the principles and requirements embodied in this Policy Statement and the appropriate Discipline Specific Guidelines.

If an applicant after at least one year of post-graduate study passes a post-graduate examination in engineering which Council recognises for this purpose, **and** the study contained an acceptable practical component, Council may on the merit of each case, give recognition to such practical component. Suitable research work with adequate practical content will be taken into account. This means that all the essential practical training elements, stated in Section 5, must be present in the advanced study.

7.8 Specialisation

Candidate engineers who have specialised in an engineering field during their practical training to the extent that they do not comply with all the requirements of Section 5, may nevertheless be registered as a professional engineers on condition that:

(i) they have attained knowledge in their field of engineering at least at the level of a masters degree; and

(ii) they have gained a minimum of five years' experience after obtaining the bachelor degree in engineering, the experience being of such a nature that it enables them to take engineering decisions with the necessary responsibility.

7.9 Lectureship

Council prefers that lecturers in engineering at tertiary institutions be registered as professional engineers in order to foster the correct attitude amongst their students with respect to professionalism and registration.

To register as professional engineers, these lecturers should do some of the following practical engineering work in addition to their lecturing:

(i) consulting work in which the applicant has demonstrated ability at a professional level to identify engineering problems and produce solutions which can be satisfactorily implemented;

(ii) planning, design, development, commissioning and/or application of research equipment or processes associated with engineering projects;

(iii) be responsible for the management of workshops, laboratories and ancillary facilities; and

(iv) execution of research projects and results (preferably published) which includes the application of the essential practical training elements stated in Section 5.

Since lecturers cannot be involved in the above-mentioned engineering work on a fulltime basis, the minimum practical training period will normally be five years but each application will be considered on merit.

7.10 Practical Training outside the Republic of South Africa

Applicants who received their practical training in engineering work abroad will be considered in accordance with the principles and requirements contained in this Policy Statement.

7.11 Responsibility of Candidate Engineers

Candidate engineers should appreciate that the onus rests on themselves to ensure that the training they receive will meet all the requirements set out in this Policy Statement. Council prefers that they follow a training programme under a Commitment and Undertaking Agreement (C&U) (See Section 8), which has been registered by Council and which, as is required, has at least one mentor registered in terms of the C&U.

Should candidate engineers experience difficulties with their training, they should attempt to resolve them through the normal channels, for example with the mentors (see § 7.13) responsible for their guidance. The relevant engineering Institutions/Institutes/bodies, recognised under the Act, have indicated their willingness to assist candidate engineers in this regard.

Candidate engineers must submit regular at least quarterly training reports to their supervisors/mentors, as arranged with their employer. The reports must clearly show the extent to which the requirements with respect to the essential practical training elements stated in Section 5 are met, as well as the extent to which they benefited from their practical training. The method and format used in these reports should be such that the persons in training find the reports useful when applying for registration as professional engineers. The mentor shall be a professional engineer or another registered person if otherwise agreed to by Council.

Note: The lack of training opportunities cannot be accepted as a reason for the lowering of the minimum standards set for registration.

7.12 Responsibility of Employers

It is recommended that employers of candidate engineers, as a matter of policy, draw up a training programme in accordance with this Section.

The employers are expected to ensure that candidate engineers are always under the guidance (not necessarily the direct supervision) of a mentor in their employ, as stated in § 7.13(a). If employers do not have suitable persons as internal mentors in their employ, they must ensure that external mentors be appointed, as stated in § 7.13(b).

7.13 Supervision of Candidate Engineers

(a) Internal Mentorship

Training should preferably be supervised by a person registered as a professional engineer in the employing organisation, who would be both guide and mentor to the candidate engineer. Professional engineers are under a moral and professional obligation to help with the training of a candidate engineer, if at all possible.

The obligations of mentors in this regard are:

(i) agreeing to give guidance to candidate engineers regarding their career planning and professional development and to advise them on suitable training programmes which meet Council's requirements;

(ii) ensuring that candidate engineers are exposed to the essential practical training elements, as stated in Section 5;

(iii) facilitate conditions and measures in order for candidate engineers to develop independent thinking;

(iv) encouraging candidate engineers to work as team members;

(v) ensuring that candidate engineers are gradually exposed to increasing engineering responsibility and **to** work of increasing complexity;

(vi) ensuring that candidate engineers incorporate quality assurance techniques in their work;

(vii) ensuring that candidate engineers gradually be exposed to more comprehensive management tasks and that they are given responsibility for them;

(viii) receiving progress reports by candidate engineers and appraising them in a critical yet constructive manner;

(ix) evaluating and reporting on the progress which the candidate engineers have made during the period under their guidance and advising candidate engineers if any deficiencies exist;

(x) ensuring that there is an equitable arrangement with the candidate engineer's supervisor for access to the candidate engineer, and to encourage the candidate engineer to ensure that the requirements of this Policy Statement are met.

(b) External Mentorship

Should the services of an internal mentor not be available to an employer, the employer may use the services of an external mentor through one of the relevant recognised engineering Institutions/Institutes/bodies. Mentors thus appointed should be sensitive to any limitations which the employer may wish to set in any given situation.

External mentors have the same duties as an internal mentor, as stated in § 7.13(a).

Direct supervision of candidate engineers need not be the mentors' function. The supervisors of candidate engineers undertake direct supervision of their daily tasks under the general guidance of their mentors. The direct supervisors need not necessarily be persons registered in the categories required for mentors as indicated in § 7.13(a).

SECTION 8

TRAINING IN TERMS OF A COMMITMENT AND UNDERTAKING (C&U)

8.1 The approval of training programmes by the previous South African Council for Professional Engineers (SACPE) started many years ago. For a programme to be approved, the employer concerned had to show that it would provide work of sufficient variety and standard to satisfy the general requirements of SACPE for each discipline. In addition, a general outline had to be given on the path of training a candidate engineer would follow together with the time spent in each portion of the programme.

8.2 Experience has shown that, with the exception of a few industries, the system of approving training programmes did not necessarily produce the desired results, mainly because factors such as the state of the economy at any given time dictated the extent to which employers were able to train their candidate engineers to meet ECSA's standards. Programmes were accordingly not strictly adhered to, thus diminishing the justification for a comprehensive and time-consuming system of approval by ECSA. This, amongst others, prompted ECSA to seek other approaches which would allow sufficient flexibility, whilst maintaining (if not strengthening) the commitment of employers and candidate engineers to training and professional development.

8.3 After due consideration ECSA accepted the following points of departure:

(a) ECSA will not be prepared to reduce standards by registering persons who, through force of circumstances beyond their control (i.e. state of the economy), could not be trained in accordance with ECSA's requirements.

(b) Candidate engineers are in any event strongly discouraged from applying for registration until they clearly meet all the requirements, regardless of the time taken to do so.

(c) Employers should be expected to provide maximum opportunity for training, given practical and financial constraints, and to ensure regular interaction between candidate engineers and their mentors. A list of mentors should be established which would enable ECSA and the Institutions/Institutes to maintain contact with mentors and to keep them abreast of the requirements.

(d) The level of commitment on the part of candidate engineers and their employers, towards achieving the desired levels of competence should determine the rate of their progress towards professional registration.

(e) The Council will maintain its established policy, namely "When in doubt about the registerability of an applicant, refuse the application". This policy is dictated by ECSA's statutory responsibility to ensure that public interest, safety and health is safeguarded. Whilst ECSA will do everything in its power to provide applicants a fair opportunity to prove their competence, minimum standards will not be compromised.

8.4 An official register was accordingly established in which a commitment and undertaking (C&U) will be registered by ECSA for all employers who apply for such registration. The system will involve the following :

Definitions

8.5 In this context the word -

"commitment" refers to the expressed resolve on the part of employers as an indication of their alignment with, and substantive support for, one of the ideals of the profession, namely that every possible opportunity, support and guidance should be afforded to candidate engineers during their period of training and professional development; and

"undertaking" refers to employers' expressed resolve to give effect to their commitment to the best of their ability.

8.6 In short, the implications of these "expressions of intent" will be that employers will be required to -

(a) structure the training of, and actually train, their candidate engineers, in accordance with the requirements of this Policy Statement as well as the relevant Discipline Specific Guidelines, and

(b) provide regular guidance to their candidate engineers through mentors.

"Training under a C & U"

8.7 Upon registration of a commitment and undertaking (C&U), employers will be expected to ensure that all the essential elements referred to in this Policy Statement as well as the Discipline Specific Guidelines have been addressed at the end of the training period.

8.8 It should be noted that by registering a C&U, employers are not discouraged from drawing up more detailed programmes appropriate to their own circumstances. In fact it is highly recommended that they do so because it represents an internal management tool to achieve the stated objectives outlined in this Policy Statement and the discipline specific requirements. ECSA has indicated its continued preparedness to assist employers in drafting their programmes, although such programmes will not be registered.

8.9 Each C&U has a permanent registration number allocated, which should be quoted by all persons when applying for registration as professional engineers.

8.10 By quoting the C&U's registration number on the application, those registered as candidate engineers will benefit because ECSA's approach to the evaluation of such applications will change. In essence the emphasis will shift from a "first principle" approach aimed at a fundamental assessment of an applicant's functional ability against all the requirements, to a "quality assurance" approach, which is aimed at verifying whether, and to what extent, the candidate engineers training was structured in accordance with the requirements.

8.11 ECSA requires an employer's Chief Executive Officer to register the C&U. Since ECSA views these "expressions of intent" in a very serious light, it must be satisfied that they not only represent corporate policy, but also that top management assumes ultimate responsibility for the proper implementation of this policy. It will accordingly be expected that CEOs issue the necessary directives to those charged with this responsibility.

8.12 The credibility of employers' C&U will be measured through an ongoing verification process where the quality of applicants' training and the level of their professionalism will be assessed. The reward will normally be that candidate engineers become registered in the shortest possible time after graduation (i.e. three to four years). In the case of an employer's consistent failure, or inability, to honour its C&U, the situation can arise where ECSA may have no alternative but to deregister such employer's C&U.

Mentors

8.13 Employers must, when registering a C&U, confirm the availability of a mentor within the organisation, or expressly undertake to arrange an external mentor to guide their candidate engineers through the required process of training.

8.14 A C&U will not be registered by ECSA unless at least one mentor (internal or external) is listed against that C&U. It will be the responsibility of the listed mentors to advise Council of their movements should their association with an employer and the particular C&U, in respect of which they had been registered, be terminated.

8.15 ECSA will only accept registered persons for purposes of listing. It will be expected of a listed mentor to demonstrate the necessary commitment and to accept professional responsibility for fulfilling this function. Guidelines for mentors are available for each discipline of engineering and can be downloaded from ECSA's website at **www.ecsa.co.za**.

8.16 A mentor should ideally be in the service of the employer whose candidate engineers require mentoring, and should be sufficiently senior to be able to influence decisions in the organisation. If a professional engineer is not available internally, employers are required to procure the services of an "external" mentor. ECSA and/or the relevant institute can be approached to assist in identifying a suitable person. While it is recognised that employers may be sensitive to "interference" from outside, it is strongly recommended that employers and external mentors define the latter's jurisdiction at the earliest opportunity.

8.17 ECSA and the Institutions/Institutes will jointly maintain a list of internal and external mentors. Persons wishing to offer their services as mentors are most welcome to forward their names to ECSA and the relevant Institute.

8.18 A mentor must be registered as a professional engineer. Council will only in exceptional cases consider the listing of experienced and mature professional engineering technologists, professional certificated engineers, or professional engineering technicians, upon application and motivation by the organisation/mentor concerned.

8.19 A mentor should not be confused with a "referee" or a "supervisor". The mentor should be a person who is able to provide guidance and professional support to candidate engineers. Mentors need not necessarily be directly involved in the day-to-day supervision of candidate engineers, whereas supervisors are persons who interact daily with candidate engineers. It is, however, possible that the mentor can also be the supervisor. The referee is normally a person who is called upon to provide an opinion on an applicant's professionalism at any particular stage during a candidate engineer's training. A referee does not carry any responsibility for guiding candidate engineers in their professional development. They happen to be persons who are well placed to express an opinion without necessarily having a holistic view of an applicant's training. It is possible that a referee can also be a mentor or a supervisor.

***An example of the C&U appears* below:**

COMMITMENT AND UNDERTAKING (C&U)

I the undersigned, _____, in my capacity as _____ of hereby wish to register our commitment and undertaking (C&U) to structure the training of, and actually train, our candidate engineers in accordance with the requirements of ECSA's Policy Statement R2/1A as well as the specific requirements laid down by ECSA in respect of the discipline of engineering.

I hereby confirm that it is our expressed intention, in so far as we are able to do so, to encourage our engineering graduates to register as candidate engineers and to provide them every possible opportunity to achieve the standard of professionalism required by ECSA.

**The professional engineers referred to in the attached Annexure have been identified from within the organisation to act as internal mentors in accordance with the guidelines set out in Policy Statement R2/1A and the more specific guidelines appropriate to the discipline of engineering, where applicable.*

**Since we do not have a person on our staff who qualifies for internal mentorship, the following person(s) has/have been appointed as external mentor(s) for our candidate engineer(s) and we undertake that we will create an environment which is conducive to effective liaison between our candidate engineer(s) and the external mentor(s).*

We hereby undertake that, in the event that any one, or more, or all of the mentors referred in this application should leave our employ, or be unable to fulfil their functions as mentors, we will immediately advise the Council of any such change and provide the name(s) of any replacement(s).

We understand and accept that ECSA has the discretion to deregister this C&U should the training provided by this organisation not satisfy ECSA's requirements, provided that ECSA shall have given reasonable notice of its intention to do so and have given reasonable time in which any deficiencies should be rectified.

** Delete whichever is not applicable*

Copies of the Commitment and Undertaking are available from ECSA's offices.

SECTION 9

PROCESS FOR REGISTRATION AS A PROFESSIONAL ENGINEER

9.1 Application for Registration as a Professional Engineer

Applicants must indicate the discipline in which application is made and provide all the information requested in the application form, before Council will consider the application.

It is essential that candidate engineers provide detailed information (with dates in chronological order) about their personal specific involvement and responsibility in engineering tasks or engineering projects. Supporting documentation for the most important of these projects in respect of each phase of training must be presented in date order. It is important that the level of responsibility reached in each phase is clearly stated.

The prescribed application fee must accompany the application

9.2 Experience Appraisal (EA)

The Experience Appraisal is an assessment of the application to determine whether candidate engineers have demonstrated that they have achieved the required level of competence and acquired the professional attributes specified in the Discipline Specific Guidelines for the engineering discipline concerned, in order to declare candidate engineers suitable for the Professional Review (PR).

(a) Applicants who did not train under a C&U, nor in accordance with the requirements of this Policy Statement and the Discipline Specific Guidelines, for the duration of their training period, will be assessed with the view to determining whether or not they are eligible for the PR. Applicants who have received their training outside the RSA would automatically be assessed via the Experience Appraisal route.

(b) If, in spite of not having trained under a C&U, it appears to ECSA that applicants may have achieved the stated objectives, they will be accepted as candidates for a PR.

(c) It may be necessary for ECSA to call for an informal interview before deciding on an applicant's candidacy. The purpose of this interview would usually be to establish the extent to which applicants meet the principles and requirements contained in this Policy Statement, the extent to which they benefited from their practical experience and whether they are ready to advance to the PR stage of their application.

(d) It is also possible that ECSA might, as an exception to the rule, dispense with the PR in cases where an applicant proves to be eminently registerable.

(e) If applicants appear not to have achieved the objectives, they will be refused registration at this stage and be advised as to the reasons for refusal to enable them to correct the deficiencies in their training.

(f) Once these applicants have corrected their deficiencies, they will be welcome to re-apply by submitting details of their remedial actions and ECSA will again assess their training for purposes of accepting them as candidates for the PR.

9.3 Professional Review (PR)

The Professional Review (PR) is a comprehensive review of the applicant's engineering career in the form of an interview, to assess the quality of their professional attributes and the level of competence achieved during the period of training. It is designed to enable candidate engineers to demonstrate that they have acquired an understanding of the professional environment in which they work; that they have developed the ability to exercise engineering judgement, to make responsible decisions, to communicate lucidly and accurately, to identify and find solutions to problems and to implement these solutions and that they have achieved an acceptable level of technical knowledge and understanding in defined training objectives within their discipline of engineering.

The PR for each candidate is undertaken by two reviewers selected from a panel of reviewers approved by the Professional Advisory Committee (PAC) concerned. Reviewers, who are senior and experienced professional engineers, are appointed to the panel following nomination by the Institutions/Institutes concerned.

After the review, the reviewers will make recommendations to PAC concerned, which moderate the outcome of the reviews. The PAC will either confirm the recommendations or decide on other options depending on the merits of each case. Applicants are then advised accordingly.

9.4 Frequency of Professional Reviews

(a) Professional Reviews take place at least four times a year. Applicants will be expected to submit their applications timeously to enable ECSA and/or the Institution/Institutes concerned to prepare the applications and make the necessary arrangements regarding venues and reviewers. Venues other than Johannesburg may also be identified at other major metropolitan centres depending on demand.

(b) Applicants will be given a choice as to which sitting they wish to present themselves, subject to deadlines and other logistical constraints.

9.5 Date of Registration

The **"Date of Registration"** is that date on which Council, through the Registration Committee for Professional Engineers, decided to register an applicant. This is also the date which appears on all registration certificates. Of necessity, it is always later than the date on which application was made, as Council requires time to consider an application.

B

Policy Statement R2/1 B

Acceptable Engineering Work for

Candidate Engineering Technologists for Registration as

Professional Engineering Technologists

Date of issue: 6/6/2002

E C S A

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CONTENTS

SECTION 1

1. EXECUTIVE SUMMARY

The Engineering Council of South Africa (hereinafter referred to as ECSA) is responsible for, *inter alia*, the setting of standards for registration of Professional Engineering Technologists and for evaluating Candidate Engineering Technologists (hereinafter referred to as CETs) who present themselves for registration. A number of factors in the rapidly changing South African environment, and in the wider world of engineering, have prompted ECSA to review its policies on standards for registration and the procedures described in this document should be carefully noted by:

- all aspirant Professional Engineering Technologists who have passed an examination required by ECSA (whether registered as Candidate Engineering Technologists or not);
- employers offering a commitment and undertaking to provide employees with the training and guidance necessary for CETs to develop the required level of professionalism; and
- all participants in the process.

1.1 Objective

The objective of this Policy Statement is to inform all stakeholders in the engineering profession in South Africa, what ECSA's requirements are for registration as Professional Engineering Technologists.

1.2 Definition of a Professional Engineering Technologist

Professional Engineering Technologists are persons who, by virtue of a combination of education, training and experience have attained a level of competence, which enables them to apply engineering principles, and techniques to the solution of engineering challenges of varying complexity as required by industry. Their education and training can be relatively broadly based but they may also have specialised in a narrow field. Their work may include a combination of, but not necessarily all the engineering functions of design, research and development, commissioning, project or construction management, measurement and testing, planning, quality assurance, production, maintenance, management and any other activities which require a high level of competence. Their decision-making is at an intellectual level requiring mature judgment, the ability to conceive, identify and optimize technical solutions beyond the mere comparison with accepted standards and norms. They accept full engineering responsibility and accountability for such decisions.

1.3 The Engineering Profession Act, 2000

The Engineering Profession Act, 2000 (Act No. 46 of 2000) requires that applicants who desire to register as Professionals *inter alia* must satisfy Council that they:

(a) have demonstrated their competence as measured against standards for the relevant category of registration; and

(b) have passed any additional examinations that may be determined by the council.

In addition this Policy Statement of ECSA describes the experience and practical training which will satisfy its requirements. For the purposes of this Policy Statement, the acceptable work of an engineering nature will generally be referred to as **"practical training"**, although far more than training, which includes responsible engineering experience, is involved.

It is further intended that this Policy Statement be used by applicants for professional registration in the various disciplines of engineering, by members of the Registration Committee and Discipline Associated Subcommittees when applications for registration are considered and also by employers when compiling practical training programmes for their Candidates.

SECTION 2

2. REGISTRATION AS A CANDIDATE

A person who has passed an accredited programme and/or examination recognised by Council is eligible for registration in the candidate category in terms of the Engineering Profession Act, 2000 (Act No. 46 of 2000). Application forms can be obtained from the Council's offices or be downloaded from ECSA's website at www.ecsa.co.za. The applicable qualification, or its equivalent, as determined by Council from time to time, is set out in Table 1:

Table 1

"Candidate" Category	Recognised or Accredited Qualifications
Candidate Engineering Technologist	B Tech (Eng)

To enable Council to determine whether or not a qualification is equivalent to a recognised qualification, an applicant may be required to attend an interview and/or to sit for an examination. Further details are obtainable from the Council's offices.

SECTION 3

3. ENGINEERING WORK FOR CANDIDATE ENGINEERING TECHNOLOGISTS (CETs)

3.1 Practical Training Requirements for Registration as a Professional

3.1.1 Post-Qualification Practical Training Requirements for Professional Registration

In this Policy Statement, **"practical training"** means engineering experience gained after attaining a recognised qualification in engineering and which may be structured or unstructured.

Council requires that prospective applicants for professional registration be trained (including availing themselves of development opportunities), to its satisfaction in the application of engineering principles and methods within their disciplines of engineering, or combination of disciplines, and be given progressively more responsibility until they are capable of accepting professional responsibility in making and executing engineering decisions at the full professional level.

Candidates must become aware of the interaction between related disciplines of engineering and the other members of the engineering team, with respect to their own tasks. They must develop the necessary judgement to involve and utilise to the best advantage other members of the engineering team. They should develop the ability to apply a holistic approach to the execution of their tasks.

The prescribed minimum practical training period after obtaining a recognised qualification is as set out in Table 2. During this period the trainee should complete a training programme designed to ensure that the training meets the requirements of Council. In the absence of structured training, it is likely that the training required will take longer than the prescribed minimum period as set out in Table 2.

ECSA is cognisant of significant differences between the nature, content and working environment of the broad disciplines of engineering and has adopted a policy for professional development within which the training, appropriate to each discipline and the procedures best suited to evaluating candidates in that discipline, can be defined. The general rule is that CETs for registration must demonstrate their professional development and competence. This requires a procedure for professional assessment by ECSA. It should be noted that standards for registration would not be compromised. Core elements of professional development and specific guidelines for training and documenting progress have been defined for each discipline of engineering. An essential component of ECSA's new approach is to relinquish the approval of specific training programmes in favour of registering a commitment and undertaking (hereinafter referred to as CU) from employers. This provides structured opportunities for CETs to actually develop professionally, in accordance with ECSA's minimum requirements. A CU registered by ECSA will have mentors nominated for assisting CETs in addition to their supervisors in the work situation.

In terms of the revised policy, candidates should benefit from their employer's CU if they provide detailed and structured information on their professional development in accordance with the relevant discipline specific guidelines. They will be able to provide detailed and structured information on their training and development in accordance with the relevant guidelines. CETs whose training is not in accordance with the relevant guidelines more strenuous and detailed professional assessment. There is clearly an incentive to follow the structured route to registration.

Implementation of this revised policy will be dependent on the requirements of the disciplines of engineering as practiced in the workplace.

3.2. Background

3.2.1 ECSA has reviewed its requirements for registration as well as its policies and procedures relating to training programmes, acceptable engineering work and professional development. This process involved finalisation of this document, preparation of a more detailed description of discipline specific requirements for each discipline of engineering and the adoption of a new approach to professional development and mentorship.

3.2.2 ECSA has taken the following factors into consideration in adopting a new approach in prescribing training requirements and the assessment of applicants:

(i) The National Qualifications Framework (hereinafter referred to as NQF) and the South African Qualifications Authority (SAQA) will have a profound effect in the training of skilled engineering practitioners in future. Engineering is one of the professions affected by government decisions and it is imperative that the engineering profession adjusts to the new circumstances and, more importantly, plays a decisive role in influencing government thinking in so far as it relates to standards setting and competency assessment.

(ii) In the interest of openness and fair administrative procedure it becomes necessary for ECSA to communicate, in more definitive terms, its policies, standards and procedures so as to enable aspirant professionals to prepare themselves better for their future careers.

(iii) Since it is one of ECSA's stated objectives to ensure that its standards should at least meet those of the international community, it is necessary to document its requirements in sufficient detail to facilitate assessment by the international engineering community.

3.2.3 ECSA's Registration Committee for Professional Engineering Technologists drafted this Policy Statement and core elements for each of the disciplines of engineering. Considering the diverse nature to engineering, recognition is given to the needs of, and requirements for, each discipline of engineering. In the case of CETs, these are developed in conjunction with the appropriate discipline specific guidelines.

Table 2: Minimum Period of Practical Training after Qualification

For Registration as	Qualifications	Period: Years
Professional Engineering Technologist	B Tech (Eng)	3

Council will in judging practical training, amongst others, take into account the following:

(a) nature of practical training (§ 3.3);

(b) standard of practical training (§ 3.4);

(c) variety of practical training (§ 3.5);

(d) recognition of advanced study (§ 3.6);

(e) continuing professional development (3.7)

(f) specialisation (§ 3.8);

(g) lectureship (§ 3.9);

(h) practical training outside the Republic of South Africa (§ 3.10).

3.3 Nature of Practical Training

3.3.1 Candidate Engineering Technologists

The practical training must include all the essential elements of practical training stated in Section 4.

The following aspects are pertinent to the "nature of practical training":

(a) The work must essentially be pre-eminently intellectual, of sufficient variety and not of a routine nature;

(b) Candidates must strive to develop the ability to:

(i) execute a task timeously and correctly, against the background of acquired knowledge and standard procedures/techniques. They must be able to show that a good balance was maintained between the development of innovative concepts or creative ability and the use of standard procedures, which simplify their task;

(ii) maintain a balance between the technical effectiveness of a solution and acceptable costs, within the available timespan; take effective decisions where the technical tools (knowledge, skills and aids) at their disposal are not sufficient to provide obvious solutions;

(iii) continuously consider the impact of their decisions on social, safety and environmental aspects, taking into account all relevant legislation.

(c) Candidates must keep themselves informed of new technological developments.

In evaluating an applicant's experience, Council takes the following aspects into consideration:

(i) the technological level at which the work was performed;

(ii) the level of technical and administrative responsibility reached by the applicant;

(iii) the measure of the variety of the tasks, which were mastered within the discipline of engineering or combination of disciplines;

(iv) applicable advanced studies which complement the work and which were completed before or during the applicable work experience (§ 3.6);

(v) the overall level of competency reached by the applicant.

3.4 Standard of Practical Training

3.4.1 Candidates

The standard required is that Candidates must increasingly develop the ability to use their theoretical and practical knowledge to the full professional level independently and without constant supervision. They should be capable of innovative planning, design and management. They must be able to provide proof that they can do their work with the necessary intellect, insight and methodical approach applicable to their category.

3.5 Variety of Practical Training

The practical training must consist of a variety of engineering tasks, which must include aspects of management, administration, economics, environmental factors, quality assurance, construction and projects, legislation and safety, at a level appropriate to each category.

"Variety of technical tasks" is taken to include those activities in a certain recognised discipline of engineering, which pertain to the practical training (problem investigation, problem solving, execution/implementation and the acceptance of responsibility) as further described in paragraph 7.

Further information regarding the variety of practical training in each discipline of engineering may be obtained from the relevant recognized engineering bodies. It is not necessarily expected from trainees that they receive practical training in all sub-disciplines of their discipline of engineering.

3.6 Recognition of Advanced Study

The prescribed minimum period (see Table 2) for practical training takes effect after attainment of a qualification recognised by Council.

Recognition of up to 12 months may be considered in respect of advanced study and then only if the nature of the work and the level of responsibility was the same as can be expected from a Candidate being trained in accordance with the principles and requirements embodied in this Policy Statement.

The following Policy is applicable for Candidate Engineering Technologists:

If an applicant after at least one year of post-graduate study passes a post-graduate examination in engineering which Council recognises for this purpose, and the study contained an acceptable practical component, Council may on the merit of each case, give recognition to such practical component. Suitable research work with adequate practical content will be taken into account. This means that all the essential practical training elements, stated in Section 4, must be present in the advanced study.

3.7 Continuing Professional Development (CPD)

CPD can be defined as "the systematic maintenance, improvement and broadening of knowledge and skills, and the development of personal qualities necessary for the execution of professional and technical duties throughout an engineer's career".

The principle to undertake CPD is included in the Engineering Profession Act, 2000 (Act 46 of 2000). At the time of registration, candidates will be assessed as having the professional competence to enable them to practice safely and effectively in their discipline of engineering.

At the technical interview Candidates will be required to provide evidence of CPD undertaken during their period of post- qualification training and indicate how they intend to meet their obligations to CPD during their professional careers. Professional Engineering Technologists are obliged by the Code of Conduct to undertake CPD, the nature, range and extent of what is required varies with the work to be undertaken. Professional Engineering Technologists are required, at all times, to take all reasonable steps to maintain and develop their competence and knowledge in their field of professional activity. Moreover, they must not under any circumstances accept or undertake work which they do not have sufficient competence, time or authority to perform, unless the necessary advice, assistance or authority is obtained.

Any combination of the activities listed below will constitute CPD:

- Attending courses, seminars, congresses and technical meetings organized by Engineering Institutes, universities, other professional bodies and course providers.
- Actively participating in conferences, serving on technical or professional committees, and activities of professional engineering institutes.
- Undertaking structured self-study (i.e. using textbooks with examples).
- Studying technical literature (e.g. journals, magazines)
- Taking correspondence courses and studying other supervised study packages.
- Taking in-house courses provided by employers.
- Enrolling for formal post-graduate studies.
- Writing technical papers or presenting lectures at an organized event.

3.8 Specialisation

Candidates who have specialised in an engineering field during their practical training to the extent that they do not comply with all the requirements of Section 8, may nevertheless be registered as a Professional on condition that:

(i) they have attained knowledge in their field of engineering at least at the level of a qualification recognised by Council; and

(ii) they have gained the minimum years of experience as stipulated in Table 2 after obtaining the qualification recognised by Council, the experience being of such a nature that it enables them to take engineering decisions with the necessary responsibility; and

(iii) they possess a qualification which is recognised by Council in the field in which they specialise, or that they can prove that their work is at a level comparable with a person holding a recognised qualification; and

(iv) Candidates who mainly use **computers as an analytical tool** in their work may be considered as specialists. Their experience should show adequate general engineering content and must be of such an engineering level and nature that other members of the engineering profession can use their results at a professional level.

3.9 Lectureship

Council prefers that lecturers in engineering at universities, universities of technology and other approved engineering training establishments be registered as Professionals in order to foster the correct attitude amongst their students with respect to professionalism and registration.

To register professionally, these lecturers should do some of the following practical engineering work **in addition to** their lecturing:

(i) consulting work in which the applicant has demonstrated ability at a professional level to identify engineering problems and produce solutions which can be satisfactorily implemented;

(ii) planning, design, development, commissioning and/or application of research equipment or processes associated with engineering projects;

(iii) be responsible for the management of workshops, laboratories and ancillary facilities; and

(iv) execution of research projects and results (preferably published) which includes the application of the essential practical training elements stated in Section 8.

(v) Lecturers lecturing at Universities of Technology and applying for registration as Professional Engineering Technologists should at least lecture subjects at B Tech level in order for their lecturing experience to be considered for registration purposes.

Since lecturers cannot be involved in the above-mentioned engineering work on a fulltime basis, the minimum practical training period will normally be five years but each application will be considered on merit.

3.10 Practical Training outside the Republic of South Africa

Applicants who received their practical training in engineering work abroad will be considered in accordance with the principles and requirements contained in this Policy Statement.

3.11 Date of Registration

The **"date of registration"** is that date on which Council decided to register an applicant. This is also the date which appears on all registration certificates. Of necessity, it is always later than the date on which application was made, as Council requires time to consider an application.

3.12 Interview

An applicant who has applied for registration as a Professional must attend an interview should Council so request. The purpose of this interview would usually be to establish the extent to which applicants meet the principles and requirements contained in this Policy Statement, the extent to which they benefited from their practical experience and whether they have accepted professional responsibility at the required level for their work, within the Code of Conduct. The interview will take the form of an experience appraisal.

3.13 Responsibility of Candidates

Candidates should appreciate that the onus rests on themselves to ensure that the training they receive will meet all the requirements set out in this Policy Statement. Council prefers that they follow a training programme under a Commitment and Undertaking Agreement (CU), which has been registered by Council and which, as is required, has at least one mentor registered in terms of the CU.

Should Candidates experience difficulties with their training, they should attempt to resolve them through the normal channels, for example with the mentors (see § 3.14) responsible for their guidance. The relevant engineering institutes/bodies, recognised under the Act, have indicated their willingness to assist Candidates in this regard.

Candidates must submit regular at least quarterly training reports to their supervisors/mentors, as arranged with their employer. The reports must clearly show the extent to which the requirements with respect to the essential practical training elements stated in Section 4 are met, as well as the extent to which they benefited from their practical training. The method and format used in these reports should be such that the persons in training find the reports useful when applying for registration as Professionals. The mentor shall be an appropriately registered person unless otherwise agreed to by Council.

Note: **The lack of training opportunities cannot be accepted as a reason for the lowering of the minimum standards set for registration.**

3.14 Supervision of Candidates (a) Internal Mentorship

Training should preferably be supervised by a person registered in an appropriate category of professional registration (see Clause 4.17) in the employing organisation that would be both guide and mentor to the Candidate. All Professionals are under a moral and professional obligation to help with the training of Candidates, if at all possible.

The obligations of mentors in this regard are:

(i) agreeing to give guidance to Candidates regarding their career planning and professional development and to advise them on suitable training programmes which meet Council's requirements;

(ii) ensuring that Candidates are exposed to the essential practical training elements, as stated in Section 4;

(iii) facilitate conditions and measures in order for Candidates to develop independent thinking;

(iv) encouraging Candidates to work as team members;

(v) ensuring that Candidates are gradually exposed to increasing engineering responsibility and to work of increasing complexity;

(vi) ensuring that Candidates incorporate quality assurance techniques in their work;

(vii) ensuring that Candidates gradually be exposed to more comprehensive management tasks and that they are given responsibility for them;

(viii) receiving progress reports by Candidates and appraising them in a **critical** yet constructive manner;

(ix) evaluating and reporting on the progress which the Candidates have made during the period under their guidance and advising Candidates if any deficiencies exist;

(x) ensuring that there is an equitable arrangement with the Candidate's supervisor for access to the Candidate, and to encourage the Candidate to ensure that the requirements of this Policy Statement are met.

(b) External Mentorship

Should the services of an internal mentor not be available to an employer, the employer may use the services of an external mentor through one of the relevant recognised engineering institutes/bodies. Mentors thus appointed should be sensitive to any limitations, which the employer may wish to set in any given situation.

External mentors have the same duties as an internal mentor, as stated in § 3.14.

(c) Supervision

Direct supervision of Candidates need not be the mentors' function. The supervisors of Candidates undertake direct supervision of their daily tasks under the general guidance of their mentors. The direct supervisors need not necessarily be persons registered in the categories required for mentors as indicated in § 3.14(a).

3.15 Responsibility of Employers

It is recommended that employers of Candidates, as a matter of policy, draw up a training programme in accordance with Section 5.

The employers are expected to ensure that Candidates are always under the guidance (not necessarily the direct supervision) of a mentor in their employ, as stated in §3.14(a). If employers do not have suitable persons as internal mentors in their employ, they must ensure that external mentors be appointed, as stated in §3.14(b).

3.16 Application for Registration as a Professional

Applicants must indicate the category for which application is made and provide all the information requested in the application form, before Council will consider the application.

It is essential that Candidates provide detailed information (with dates in chronological order) about their personal specific involvement and responsibility in engineering tasks or engineering projects. Supporting documentation for the most important of these projects in respect of each phase of training must be presented in date order. It is important that the level of responsibility reached in each phase is clearly stated.

The prescribed application fee must accompany the application. **3.17 Code of Conduct**

It is of the utmost importance that Candidates, throughout the practical training period, remain aware of, and act according to, the Code of Conduct for the engineering profession as contained in the rules in terms of the Engineering Profession Act, 2000 (Act No. 46 of 2000), a copy of which is obtainable from the Council's offices. The Code of Conduct will also be forwarded to each person upon registration as a Candidate.

SECTION 4

4. TRAINING PROGRAMMES AND MENTORS

4.1 Experience has shown that, with the exception of a few industries, the system of approving training programmes did not necessarily achieve the desired results, mainly because factors such as the state of the economy at any given time dictated the extent to which employers were able to train their CETs to meet ECSA's standards. Programmes were accordingly not strictly adhered to, thus diminishing the justification for a comprehensive and time-consuming system of approval by ECSA. This, amongst others, prompted ECSA to seek other approaches, which would allow sufficient flexibility, whilst maintaining (if not strengthening) the commitment of employers and CETs to training and professional development.

4.2 After due consideration ECSA accepted the following points of departure:

(i) CSA will not be prepared to reduce standards by registering persons who, through force of circumstances beyond their control (e.g. state of the economy), could not be trained in accordance with ECSA's requirements.

(ii) CETs are in any event strongly discouraged from applying for registration until they clearly meet all the requirements, regardless of the time taken to do so.

(iii) Employers should be expected to provide maximum opportunity for training, given practical and financial constraints, and to ensure regular interaction between CETs and their mentors. A list of mentors should be established which would enable ECSA and the Institutes to maintain contact with mentors and to keep them abreast of the requirements.

(iv) The level of commitment on the part of CETs and their employers, towards achieving the desired levels of competence would determine the rate of their progress towards professional registration.

(v) The Council will maintain its established policy, namely " To ensure as far as is possible, that the applicant is registerable before acceptance". This policy is dictated by ECSA's statutory responsibility to ensure that public interest, safety and health are safeguarded. Whilst ECSA will do everything in its power to provide applicants a fair opportunity to prove their competence, minimum standards will not be compromised.

4.3 An official register was accordingly established in which a CU would be registered by ECSA for all employers who apply for such registration. The system will involve the following:

Definitions

In this context the word –

"**commitment**" refers to the expressed resolve on the part of employers as an indication of their alignment with, and substantive support for, one of the ideals of the profession, namely that every possible opportunity, support and guidance should be afforded to CETs during their period of training and professional development; and

"**undertaking**" refers to employers' expressed resolve to give effect to their commitment to the best of their ability.

4.4 In short, the implications to these " expressions of intent " will be that employers will be required to –

(i) structure the training of, and actually train, their CETs, in accordance with the requirements of this Policy Statement as well as the relevant discipline specific guidelines, and

(ii) provide regular guidance to their CETs through mentors.

"Training under a CU"

4.5 Upon registration of a CU, employers will be expected to ensure that all the essential elements referred to in this Policy Statement as well as the discipline specific guidelines have been addressed by the end of the training period.

4.6 It should be noted that by registering a CU, employers are not discouraged from drawing up more detailed programmes appropriate to their own circumstances. In fact it is highly recommended that they do so because it represents an internal management tool to achieve the stated objectives outlined in this Policy Statement and the discipline specific requirements. ECSA has indicated its continued preparedness to assist employers in drafting their programmes, although such programmes will not be registered.

4.7 Section 5 deals specifically with training programmes and whilst this section still holds true in terms of what is considered a desirable format of a training programme, it should now be considered as a guideline for an internal training programme.

4.8 Each CU will have a permanent registration number allocated, which should be quoted by all persons when applying for registration as professional engineering technologists.

4.9 Since ECSA views these "expressions of intent "in a very serious light, it must be satisfied that they not only represent corporate policy, but also that top management assumes ultimate responsibility for implementation of this policy. It will accordingly be expected that CEOs issue the necessary directives to those charged with this responsibility.

4.10 The credibility of an employer's CU will be measured through an ongoing verification process where the quality of applicants' training and the level of their professionalism will be assessed. The advantage will normally be that CETs become registered in the shortest possible time after graduation. In the case of an employer's consistent failure, or inability, to honour its CU, the situation can arise where ECSA may have no alternative but to deregister such employer's CU.

Mentors

4.11 Employers must, when registering a CU, confirm the availability of a mentor within the organisation, or expressly undertake to arrange an external mentor to guide their CETs through the required process of training.

4.12 A CU will not be registered by ECSA unless at least one mentor (internal or external) is listed against that CU. It will be the responsibility of the listed mentors to advise Council of their movements should their association with an employer and the particular CU, in respect of which they had been registered, be terminated.

4.13 ECSA will only accept registered persons for purposes of listing. It will be expected of a listed mentor to demonstrate the necessary commitment and to accept professional responsibility for fulfilling this function. Guidelines for mentors are contained in clause 3.14 of this Policy Statement and further communications will from time to time be directed to mentors.

4.14 A mentor should ideally be in the service of the employer whose CETs require mentoring, and should be sufficiently senior to be able to influence decisions in the organisation. If a professional engineering technologist or professional engineer is not available internally, employers are required to procure the services of an "external" mentor. ECSA and/or the relevant institute can be approached to assist in identifying a suitable person. While it is recognised that employers may be sensitive to " interference" from outside, it is strongly recommended that employers and external mentors define the latter's jurisdiction at the earliest opportunity.

4.15 ECSA and the institutes will jointly maintain a list of internal and external mentors. Persons wishing to offer their services as mentors are most welcome to forward their names to ECSA and the relevant Institute.

4.16 A mentor must be registered as a professional engineer or professional engineering technologist. Council will only in exceptional cases consider the listing of experienced and mature professional certificated engineers, or professional engineering technicians, with the knowledge and experience requirements for registration as a professional engineering technologist, upon application and motivation by the organisation/ mentor concerned.

4.17 A mentor should not be confused with a "referee" or a " supervisor". The mentor should be a person who is able to provide guidance and professional support to CETs. Mentors need not necessarily be directly involved on the day-to-day supervision of CETs, whereas supervisors are persons who interact daily with CETs. It is, however, possible that the mentor can also be the supervisor. The referee is normally a person who is called upon to provide an opinion on an applicant's professionalism at any particular stage during a CETs training. A referee does not carry any responsibility for guiding CETs in their professional development. They happen to be persons who are well placed to express an opinion without necessarily having a holistic view of an applicant's training. It is possible that a referee can also be a mentor or a supervisor.

SECTION 5

5. PRACTICAL TRAINING PROGRAMMES

5.1 An acceptable practical training programme should contain an undertaking that the employer will provide practical training to meet the requirements of the principles contained in this Policy Statement.

Such a practical training programme for Candidates should include the following:

(a) an indication of the time to be spent on each essential practical training element and the level of responsibility and competency envisaged, as stated in Section 4;

(b) the guidance that the mentors/supervisors will be giving the Candidate;

(c) the training reports that will be expected from the Candidates and from the mentors/ supervisors and other personnel involved on a regular basis (**at least** quarterly), as described in § 3.13.

5.2 The general planning and co-ordination of the practical training should be under the guidance of a mentor who should preferably be a senior Professional in the appropriate category in the employer organisation.

5.3 A record of the practical training should be kept. The record should indicate the extent to which the work meets the requirements of acceptable practical training.

5.4 Individual practical training programmes should contain a clear statement reminding Candidates that the onus rests on themselves to ensure that the practical training they are receiving will meet the requirements contained in this Policy Statement, as detailed in § 3.13.

5.5 In cases where employers of Trainees are unable to provide complete training as described in this Policy Statement, consideration should be given to the secondment of Trainees to other employers for this purpose.

An example of the CU appears below:

Commitment and Undertaking (CU)

I the undersigned, , in my capacity as _____ of _____ hereby wish

to register our commitment and undertaking (CU) to structure the training of, and actually train, our candidate engineering technologists in accordance with the requirements of ECSA's Policy Statement R2/1 B as well as specific requirements laid down by ECSA in respect of the discipline of engineering.

I hereby confirm that it is our expressed intention, in so far as we are able to do so, to encourage our engineering graduates to register as candidate engineering technologists and to provide them every possible opportunity to achieve the standard of professionalism required by ECSA.

- *The professional engineering technologists and/or professional engineer referred to in the attached Annexure have been identified from within the organisation to act as internal mentors in accordance with the guidelines set out in Policy Statement R2/1 B and the more specific guidelines appropriate to the discipline of engineering, where applicable, or;*

- *Since we do not have a person on our staff who qualifies for internal mentorship, the following person(s) has/have been appointed as external mentor(s) for our candidate engineering technologists and we undertake that we will create an environment which is conducive to effective liaison between our candidate engineering technologists and the external mentor(s).*

We hereby undertake that, in the event that any one, or more, or all of the mentors referred in this application should leave our employ, or be unable to fulfil their functions as mentors, we will immediately advise the Council of any such change and provide the name(s) of any replacement(s).

We understand and accept that ECSA has the discretion to deregister this CU should the training provided by this organisation not satisfy ECSA's requirements, provided that ECSA shall have given reasonable notice of its intention to do so and have given reasonable time in which any deficiencies should be rectified.

- *Delete whichever is not applicable* **Copies of the Commitment and Undertaking are available from ECSA's offices.**

SECTION 6

6 DISCIPLINE SPECIFIC GUIDELINES

6.1 The essential elements of acceptable engineering work have been defined in broad terms in this Policy Statement. These cover all the generic elements relevant to the main disciplines of engineering recognised by ECSA. **It should be noted that this document deals exclusively with University of Technology graduate Technologists in engineering.**

6.2 In addition to this Policy Statement, ECSA has prepared discipline specific guidelines for each of the main disciplines of engineering recognised by ECSA. The discipline specific guidelines are intended to be complementary to this Policy Statement.

6.3 Where employers have engineering graduates in more than one discipline of engineering, they should take careful note of the differences between the various disciplines.

6.4 All the disciplines of engineering will follow essentially the same procedure in assessing applications.

6.5 It will, however, be expected of CETs to provide more structured and detailed information of their training than in the past. In essence, this new dispensation is aimed at providing more specific guidelines to CETs and then requiring them to report in more specific terms when applying for registration as professional engineering technologists. If this requirement is met, the Registration Committee for Professional Engineering Technologists will be able to assess the quality and extent of an applicant's professional development without necessarily calling for an interview.

6.6 It is of utmost importance that CETs should consult the discipline specific guidelines and the application forms for the particular engineering disciplines in which they have received their training, because these documents contain essential details on the type of information, which ECSA requires for registration in any specific discipline of engineering.

6.7 Experience appraisal

(i) As it will not normally be possible to assess the level of training of applicants who did not train under a CU, nor in accordance with the requirements of this Policy Statement and the Discipline Specific Guidelines for the duration of their training period, they will be assessed with the view to determining whether or not they are eligible for registration via the experience appraisal route which will result in a pre review committee assessment and recommendation prior to a technical interview. Applicants who have received their training outside the R.S.A. would normally be assessed via this route.

(ii) If, in spite of not having trained under a CU, it appears to ECSA, from the submitted application forms, that applicants may have achieved the stated objectives, they will be accepted as candidates for a technical interview which will include submission of calculations and a presentation of the applicant's training and engineering and responsible engineering experience reports.

(iii) If applicants appear not to have achieved the objectives, they will be refused registration at that stage and be advised as to the reasons for refusal to enable them to correct the deficiencies in their training

(iv) Once these applicants have corrected their deficiencies, they will be welcome to re-apply by submitting details of their remedial actions and ECSA will again assess their training for purposes of accepting them as candidates for the professional review.

(v) Depending on circumstances candidates who have not trained under a CU may expect to take longer to achieve acceptable competency in all the prescribed objectives.

6.8 Technical Interview

Applicants may be required to undergo a technical interview, which will include the submission of calculations and a presentation of the applicant's training and responsible engineering experience reports.

6.9 Transitionary Period

A Transitionary period will be allowed before the new system is fully implemented. The rationale for this is not to disadvantage CETs who have been in the pipelines for more than one year.

SECTION 7

7. WHAT GRADUATES AND EMPLOYERS SHOULD DO

7.1 All employers having training programmes, which have previously been accepted by ECSA, should review their programmes on the basis of this Policy Statement and the discipline specific guidelines appropriate to that discipline. CETs, and graduate Technologists not already registered as such, should remind their employers of their moral obligation to do so.

7.2 The ultimate responsibility, however, remains with the CET who wishes to become registered as a Professional Engineering Technologist.

7.3 Employers should, identify registered persons in their employ who are able and willing to act as mentors and advise ECSA of their names when registering their CUs. It should be clear from the submission whether these mentors will act as internal mentors only or whether they also with to offer their services as external mentors to other CETs who do not have the benefit of an internal mentor.

7.4 Although this Policy Statement will automatically be posted to all CETs and those employers with accepted training programmes, copies of the relevant discipline specific guidelines and application forms should be obtained from ECSA without delay.

SECTION 8

8. ESSENTIAL ELEMENTS OF ACCEPTABLE PRACTICAL TRAINING 8.1

8.1 Elements applicable to Candidates

Acceptable practical training must provide satisfactory experience to Candidates in the application of engineering principles and methods and must include the practical training elements as stated in clauses 7.1.1 to 7.1. 3 inclusive at the level of responsibility stated in the Discipline Specific Guidelines.

8.1.1 Problem Investigation

The work must be aimed at investigating engineering problems and for which engineering judgement is required. The following practical engineering functions are contained in such work to a greater or lesser degree:

(a) problem identification and formulation;

(b) finding and selecting relevant information;

(c) evaluating, investigating, testing and research;

(d) analysis of all factors that influence the solution like relevant engineering and scientific principles;

(e) taking into account all practical, economic, social, environmental, quality assurance, safety and statutory factors.

8.1.2 Problem Solution

The work must be aimed at the full development of the suggested solution to the problem through a process of synthesis, with the application of all information acquired during the problem investigation, also using design, development and communication. This includes but is not limited to the drawing up of plans, detailed designs, reports, specifications, adjudication of tenders taking into account all practical, economic, social, environmental, quality assurance, safety and statutory factors.

8.1.3 Execution / Implementation

The work must be aimed at the execution of engineering tasks or projects (for example construction, manufacturing, transformation, processing, production, commissioning, testing, certification, quality assurance, operation, maintenance and closure) encompassing the efficient utilisation of people, materials, machines, equipment, means and funding with due regard for their interaction, to achieve the end result within the set parameters.

8.1.4 Responsibility

The work must be aimed at increasing engineering and managerial responsibility until Candidates are clearly able to accept full professional responsibility for taking engineering decisions. Part of their responsibility should also be to ensure that sufficient cognisance is taken of economic considerations, social circumstances, environmental factors, quality assurance, safety and legal aspects as well as of the Code of Conduct.

Notes:

(i) The degree of responsibility of Candidates, as well as their personal and specific involvement with each project, should be clear from the reports, which accompany their applications;

(ii) different weights may be awarded to the essential elements of practical training, depending on the requirements of the specific engineering disciplines;

(iii) different composition of the essential practical training elements may be structured in order to evaluate the level of work performed. These could be application of technological knowledge, manipulative skills, thinking skills, communication skills, interpersonal skills and management skills.

Technicians

POLICY STATEMENT R2/1C

Acceptable Engineering Work for Registration of Professional Engineering Technicians

Date of issue: 28/8/2001

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Purpose of the Policy Statement R2/1C

This policy statement describes the education, training and professional development required by the Council for registration as a Professional Engineering Technician.

1. Introduction

1.1 Categories - Professional Engineering Technician and Candidate Engineering Technician

(a) Professional Engineering Technicians are people who recommend, control, administer and implement known or novel technology in an innovative manner in a discipline, sub-discipline or specialisation of engineering. They are registered in terms of Section 18(1)(a)(iv) of the Engineering Profession Act, 2000 (Act No 46 of 2000). – (the Act)

(b) Candidate Engineering Technicians are people who have an educational qualification recognised by Council for the purpose of registration as a Candidate Engineering Technician. They are registered in terms of Section 18(1)(b)(iv) of the Act.

1.2 The significance of registration as a Professional Engineering Technician

The significance of registration as a Professional Engineering Technician is that:

(a) It is a commitment to subscribe to the standards set by ECSA and to work within the ECSA Code of Conduct.

(b) It is proof of competency in terms of the standards of a Professional Engineering Technician, measured by peers.

These features contribute to the protection of the public with respect to the work of a Professional Engineering Technician and lend confidence in appointing such a person to carry out engineering work.

2. Criteria for Registration

(For purposes of this document "Council," means the Engineering Council of South Africa established in terms of the Act, or any committee duly authorised by the Council to fulfill certain functions on behalf of the Council.)

Section 19(2)(a) and (b) of the Act reads as follows:

"19(2) The council must register the applicant in the relevant category and issue a registration certificate to the successful applicant in the prescribed form if, after consideration of an application, the council is satisfied that the applicant –

*(a) in the case of a person applying for registration as a **professional [engineering technician]** – (own parenthesis)*

(i) has demonstrated his or her competence as measured against standards determined by the council for the relevant category of registration; and

(ii) has passed any additional examinations that may be determined by the council;

*(b) in the case of a person applying for registration as a **candidate [engineering technician]** …, has satisfied the relevant educational outcomes determined by the council for this purpose, by – (own parenthesis)*

(i) having passed accredited or recognised examinations at any educational institution offering educational programmes in engineering; and

(ii) having passed any other examination that may be determined by the council; or

(iii) presenting evidence of prior learning in engineering."

3. Engineering Work for Candidate Engineering Technicians

3.1 Practical Training

Practical training should result in the Candidate Engineering Technician developing the competence required for registration as a Professional Engineering Technician. It includes but is not limited to an appropriate combination of:

(a) Engineering work

(b) Practical training courses or exercises

(c) Theoretical courses and advanced studies

The training of Candidate Engineering Technicians enables them to implement known and novel technology in an innovative manner to complete engineering work. Practical Training leads to autonomy and competence regarding evaluation, consultation and implementation of work. This enables individuals to take professional responsibility for work.

Practical Training should preferably be structured and undertaken with a Commitment and Undertaking in place (See Section 4).

A Candidate Engineering Technician would normally complete the Practical Training phase upon registration as a Professional Engineering Technician.

3.2 Duration of Practical Training

The minimum duration of practical training is three years.

Council will consider experience and training prior to obtaining an educational qualification on merit when assessing competence.

3.3 Scope of Practical Training

In this document the scope of training is described in generic terms. Additional information relating to specific disciplines or specialisations of engineering will be published in separate in discipline-specific guidelines.

Practical training must include, but is not limited to, the following:

(a) Application of known and novel technology. A variety of activities or functions to carry out engineering work within a specific discipline (e. g. civil), sub-discipline (e.g. electrical light current - process control) or combination of disciplines of engineering (e.g. mechanical, electrical, process, chemical) and may include a specialisation.

(b) There are a variety of activities or functions, which candidate engineering technicians may carry out in the execution of engineering work. These include:

(i) Design & draughting, specifying, planning
(ii) Manufacturing, construction, installation, calibration, commissioning, operating, monitoring
(iii) Maintenance, modification, development
(iv) Operational management, economics and resources management

The number and ratio of activities carried out is determined by the discipline and the working environment.

(c) Social, economic, safety, health and environmental issues within engineering practice.

(d) Candidate engineering technicians need to develop their skills to communicate effectively, covering oral, written, drawn & electronic communication.

(e) Independent work, teamwork, supervision and management.

(f) Increasing responsibility and accountability for work.

Training must be developmental, building upon the knowledge and skill gained through the educational qualification. This is indicated through innovation in the application of technology, acquisition of knowledge through research, additional studies and continuing professional development, and increasing scope of work.

Candidate engineering technicians should also assist in facilitating of the education, training and development of others through mentoring and coaching of subordinates.

3.4 Level/Range of Training

In the setting up of a training program the following are considered appropriate:

(a) Generally defined work packages (problems, projects, etc).

(b) Work normally conducted in accordance with standards, codes and procedures. Work beyond these may be required and may be acceptable given that the candidate demonstrates sound judgement in this regard.

(c) Problem solving requiring the use of fundamental principles, underlying techniques and calculations based on formulas.

(d) Increasing responsibility and accountability for work and accepted by the Candidate Engineering Technician.

(e) Consultation with relevant people when appropriate.

(f) Tasks/project/activities undertaken become larger and more complex.

(g) Compliance with legislation.

(h) Compliance with the Code of Conduct.

(i) Evaluation of work by the candidate, supervisor and or client.

4. Training under a Commitment and Undertaking

Training under a Commitment & Undertaking requires that the Candidate Engineering Technician and the employer work together to use the opportunities available to achieve the scope of training described in Section 3.

The benefit of training under a Commitment and Undertaking is the achievement and recognition of the standard of competence that is accepted for Professional Engineering Technicians in an efficient manner.

4.1 Objective of a Commitment & Undertaking

The objective of a Commitment & Undertaking Agreement (C&U) is to ensure that the post- educational qualification training and development of Candidate Engineering Technicians is carried out to the level required for registration as a Professional Engineering Technician, and in a manner that is to the mutual benefit of the Candidate Engineering Technician, the employer, and the public at large.

Definitions

In this context the word –

"**commitment"** refers to the expressed resolve on the part of employers as an indication of their alignment with, and substantive support for, one of the ideals of the profession, namely that every opportunity, support and guidance should be afforded to candidates during their period of training and professional development:
and

"**undertaking**" refers to employers' express resolve to give effect to their commitment to the best of their ability.

In short, the implications of these "expressions of intent" will be that employers will be required to–

(a) Structure the training of, and actually train, their candidates, in accordance with the requirements of this Policy Statement and any discipline guideline issued by ECSA for the purpose of training candidates.
(b) Provide regular guidance to their candidates through competent supervisors, mentors and referees as set out in the guideline.

4.2 Features & Requirements for training under a Commitment and Undertaking Agreement

(a) Upon registering a CU, employers will be expected to ensure that all the essential elements referred to below are addressed during practical training.
(b) It should be noted that by registering a CU, employers are encouraged to draw up more detailed programmes appropriate to their own circumstances.

(c) Each CU will have a permanent registration number allocated. All persons when applying for registration as Professional Engineering Technicians should quote this number.

(d) ECSA views these "expressions of intent" in a very serious light. It must be satisfied that they not only represent corporate policy, but also that top management assumes ultimate responsibility for implementation of this policy. It will accordingly be expected that Chief Executive Officers issue the necessary directives to those charged with this responsibility.

(e) Credibility of employers' CUs will be measured through an ongoing verification process where the quality of applicants' training and the level of their professionalism will be assessed.

(f) In the case of an employer's constant failure or inability to honour its CU, the situation can arise where ECSA may have no alternative but to deregister such employer's CU.

(g) The key to operating successfully under a CU is mentorship. Therefore, employers must when registering a CU, confirm the availability of a mentor within the organisation, or expressly undertake to arrange an external mentor to guide their candidates through the process of training.

(h) A CU will not be registered by ECSA unless at least one mentor (internal or external) is listed against that CU. It is a responsibility of the listed mentors to advise Council of their movements should their association with an employer and a particular CU in respect of which they have been registered be terminated.

(i) For the purpose of listing, mentors are required to be registered persons who demonstrate the necessary commitment and accept the professional responsibility to fulfil this function.

(j) In addition to mentoring, the employer must ensure the availability of supervisors and referees for effective training.

A pro forma of the Commitment and Undertaking is provided at the end of this Policy Statement.

4.3 Role of Mentor

The mentor is required to oversee the training of the individual Candidate Engineering Technician on a regular basis. This includes:

(a) Assuring that the Candidate Engineering Technician has a training plan that addresses the issues described in 3 above.

(b) Assuring that the training is managed against the training plan. Management of deviations from the plan that are encountered in the working environment is considered an important component of the development of a Candidate Engineering Technician.

(c) Assuring that the day-to-day supervision and training is carried out by competent persons, who ECSA recommends should be registered preferably in the category of Professional Engineering Technician. This competency includes:
   (i) Technical expertise regarding the work being done.
   (ii) Expertise in supervision and training of Candidate Engineering Technicians.
   (iii) Commitment to supervision and training of Candidate Engineering Technicians.

(d) Providing guidance and encouragement other than 'day-to-day' supervision and training. This is often of an informal/personal nature.
(e) Ensuring that the Candidate Engineering Technician receives fair opportunity to develop and fair assessment.
(f) Acting as a role model.

A mentor may act as a trainer, supervisor or referee. However, it is advisable to make use of other referees when this is possible.

4.4 Attributes of Mentors

The following attributes are considered essential for a mentor to ensure successful professional mentorship:

(a) Technical competency at the level of a Professional Engineering Technician.
(b) Ability and position/relationship with the employer/sponsoring organisation to execute the duties listed in 4.3 above.
(c) Experience of learning through a Commitment & Undertaking agreement or similar process.
(d) Commitment to carry out the duties of a mentor.

5. Documentation for the Recording of Training

Documentation is part of the practical training process. As such it is understood that the Candidate Engineering Technician is responsible for preparing and keeping documentation that is necessary to manage the training process.

Portfolio of Learning

(a) A portfolio of learning is an individual's record of knowledge and skills acquired during his or her career.
(b) Council does not prescribe documentation for a training programme or that a portfolio is a compulsory part of practical training.
(c) It is recommended that Candidate Engineering Technicians keep records of their training. An adequately compiled portfolio of learning, kept up to date with ones learning, contains the evidence necessary to submit an application for registration when the required standard is reached.

This makes the preparation of an application for registration far easier than it would be if evidence must be collected some years after the learning took place.

(d) It is strongly recommended that Candidate Engineering Technicians include the following in their portfolios:

(i) Copies of training programmes and records of compliance with programmes

(ii) Records of achievements

(iii) Assessment results

(iv) Documentation from supervisors, coaches, assessors and mentors

(v) Examples or evidence of work done

In addition it is recommended that training and experience reports *(as found in the application form for registration, available from ECSA – at www.ecsa.co.za)* are completed and signed by supervisors when relevant sections of work *(such as projects)* are completed. *This will save having to recreate reports and find individuals who can vouch for authenticity some time after the work has been completed.*

6. Continuing Professional Development (CPD)

CPD can be defined as the systematic maintenance, improvement and broadening of knowledge and skills, and the development of personal qualities necessary for the execution of professional and technical duties throughout an engineering practitioner's career.

The principle to undertake CPD is included in the Engineering Profession Act, 2000 (Act 46 of 2000). At the time of registration, candidates will be assessed as having the professional competence to enable them to practice safely and effectively in their discipline of engineering. Professional Engineering Technicians are obliged by the Code of Conduct to undertake CPD, the nature, range and extent of what is required varies with the work to be undertaken. Professional Engineering Technicians are required, at all times, to take all reasonable steps to maintain and develop their competence and knowledge in their field of professional activity.

Any combination of activities listed below will constitute CPD:

- Attending courses, seminars, congresses and technical meetings organized by engineering institutes, universities, other professional bodies and course providers.
- Actively participating in conferences, serving on technical or professional committees, and activities of professional engineering institutes.
- Undertaking structured self-study (i.e. using textbooks with examples).
- Studying technical literature (e.g., journals, and magazines).
- Taking correspondence courses and studying other supervised study packages.
- Taking in house courses provided by employers.

- Enrolling for formal post diploma studies.
- Writing technical papers or presenting lectures at an organized event.

7. Application Documentation

Applications for registration must be made using the application form as prescribed by Council.

Application forms must be completed and supporting evidence submitted in accordance with the instructions provided in the forms. Failure to comply with the instructions is likely to result in a deficient application and may prejudice the success of the application. It may also result in a delay in processing the application because an application will not be considered unless complete.

8. Registration Process

8.1 Process Followed

The process followed is specified in the Rules for the Registration Committee for Professional Engineering Technicians that are prescribed by the Council. This includes:

(a) Administration regarding the application – recording receipt of the application, checking for completeness, submission to the Registration Committee for Professional Engineering Technicians (Committee)

(b) Review by a sub-committee

(c) Review of recommendation by the Committee or referral to a second sub-committee (in the case of doubt regarding competency)

(d) Examination as prescribed by Council – *this is currently an interview of the candidate by an interviewing committee comprising peers nominated by the Committee*.

(e) Decision by the Committee based on the recommendations of the sub-committee(s) and the outcome of the examination.

(f) Registration and written confirmation to the applicant when successful.

(g) Referral to the Central Registration Committee and Council in the case of a refusal to register.

(h) Communication of the decision regarding registration.

8.2 Possible Reduction of the Process

(a) When the written application contains evidence that satisfies the Committee of an applicant's competence, the Committee may in its discretion exempt an applicant from the examination.

(b) Completing good training under a Commitment & Undertaking should normally result in adequate training and a successful application. This means that a Candidate Engineering Technician who successfully completes practical training under a Commitment & Undertaking could expect to be exempted from the examination.

9. Alternative Route

Council considers all evidence submitted by an applicant for registration as a Professional Engineering Technician. This includes qualifications that are not recognised by ECSA for the purposes of registration and experience that was not obtained through structured practical training, as described in 3.1 above. The credit value of such evidence towards registration is determined by Council.

Proforma of a Commitment & Undertaking

COMMITMENT AND UNDERTAKING (CU)

I the undersigned,_____ in my capacity as

_____of _____

hereby wish to register our commitment and undertaking (CU) to structure the training of, and actually train, our candidate engineering technicians in accordance with the requirements of Policy Statement R2/1C "Acceptable Engineering Work for the Registration of Professional Engineering Technicians."

I hereby confirm that it is our express intention, in so far as we are able to do so, to encourage our engineering diplomats to register as Candidate Engineering Technicians and to provide them with every opportunity to achieve the standard of professionalism required by ECSA.

- *The Professional (or Registered) Engineering Technicians and or Professional Engineering Technologists or Professional Engineers referred to in the attached Annexure have been identified from within the organisation to act as internal mentors in accordance with Policy Statement R2/1C.*

- *Since we do not have a person on our staff who qualifies as an internal mentor the following person(s) has/have been appointed as external mentor(s) for our candidate engineering technicians and we undertake that we will create an environment which is conducive to effective liaison between our candidate engineering technicians and the external mentors.*

We hereby undertake that in the event that any one or more or all of the mentors referred to in this application should leave our employ, or be unable to fulfill their functions as mentors, we will immediately advise the Council of such change and provide the name(s) of any replacement(s).

We understand and accept that ECSA has the discretion to deregister this CU should the training provided by this organisation not satisfy ECSA's requirements, provided that ECSA shall have given reasonable notice of its intention to do so and have given reasonable time in which any deficiencies should be rectified.

- *(Delete whichever is not applicable)*

_____

POLICY STATEMENT R2/1D

Acceptable Engineering Work for Registration as a Professional Certificated Engineer

Date of issue: 1 August 2002

Candidate Certificated Engineers

Professional Certificated Engineers

E C S A

ENGINEERING COUNCIL OF SOUTH AFRICA

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5. TRAINING PROGRAMMES AND MENTORS

SECTION 1

1. INTRODUCTION

1.1 Definition

Professional Certificated Engineers are persons who are registered with the Engineering Council of South Africa (ECSA), as such in terms of section 19(2) of the Engineering Profession Act, 2000 (Act No 46 of 2000). They hold an appointment, which requires the possession of a Government Certificate of competency as a Manager or as an Engineer in terms of the Mines Health and Safety Act, 1996 (Act No 29 of 1996), or as an Engineer in terms of the Occupational Health and Safety Act, 1993 (Act No 85 of 1993) or as a Chief Engineer Officer – Foreign Going on a vessel with a registered power of no less than 3 000 kW in terms of the Merchant Shipping Act, 1951 (Act No 57 of 1951), or in terms of any Act 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.

1.2 Purpose

The Engineering Profession Act, 2000 (Act No. 46 of 2000) requires that applicants who desire to register as Professionals **inter alia** must satisfy Council that they:

(a) have demonstrated their competence as measured against standards determined by the Council for the relevant category of registration; and

(b) have passed any additional examinations that may be determined by the Council.

The purpose of this Policy Statement of the Engineering Council of South Africa is to describe the experience and practical training which will satisfy the council's requirements. For the purposes of this Policy Statement, the acceptable work of an engineering nature will generally be referred to as **"practical training"**, although far more than training is involved.

SECTION 2

2. REGISTRATION AS A CANDIDATE

A person who has passed an accredited or recognised examination or any other examination determined by Council is eligible for registration in the candidate category in terms of the Engineering Profession Act, 2000 (Act No. 46 of 2000). Application forms can be obtained from the Council's offices or be downloaded from ECSA's website at www.ecsa.co.za. The applicable qualifications, or their equivalents, as determined by Council from time to time, are set out in Table 2:

Table 2:

"Candidate" Category	Recognised Qualifications
Candidate Certificated Engineer	The following Certificates of Competency (which should not be of limited scope): • Electrical Engineer's Certificate of Competency issued i.t.o. the Mines Health and Safety Act (MH&S Act) • Mechanical Engineer's Certificate of Competency issued i.t.o. the MH&S Act • Electrical Engineer's Certificate of Competency issued i.t.o. the Occupational Health and Safety Act (OH&S Act) • Mechanical Engineer's Certificate of Competency issued i.t.o. the OH&S Act • Manager's Certificate of Competency (Metalliferous) issued i.t.o. the MH&S Act • Manager's Certificate of Competency (Coal) issued i.t.o.MH&S Act • Chief Engineer Officer – Foreign Going Certificate of Competency issued i.t.o the Merchant Shipping Act(MS Act)
Progression to Professional Certificated Engineer	A minimum period of three (3) years appropriate post-Government Certificate of Competency experience, which shall include a legal appointment as a Certificated Engineer for at least one year and evidence of continuing professional development throughout.

SECTION 3

3. ENGINEERING WORK FOR CANDIDATE CERTIFICATED ENGINEERS

3.1 Post-Qualification Practical Training Requirements for Professional Registration

In this Policy Statement, **"practical training"** means engineering experience gained after attaining a recognised qualification in engineering and which may be structured or unstructured.

Council requires that prospective applicants for professional registration be trained (including availing themselves of development opportunities), to its satisfaction in the application of engineering principles and methods within their branches of engineering, or combination of branches, and be given progressively more responsibility until they are capable of accepting professional responsibility in making and executing engineering decisions at the full professional level.

Candidate Certificated Engineers (CCE's) must become aware of the interaction between related branches of engineering and the other members of the engineering team, with respect to their own tasks. They must develop the necessary judgement to involve and utilise to the best advantage other members of the engineering team. They should develop the ability to apply a holistic approach to the execution of their tasks.

The prescribed minimum practical training period after obtaining a recognised qualification is as set out in Table 3. During this period the CCE should complete a training programme designed to ensure that the training meets the requirements of Council. In the absence of structured training, it is likely that the training required will be of longer duration than the prescribed minimum period as set out in Table 3.

Table 3 **Minimum Period of Practical Training after Qualification**

For Registration as	Qualifications	Period: Years
Professional Certificated Engineer	Government Certificate of Competency which shall include a legal appointment as a Certificated Engineer for at least one year	3

3.2 Nature of Practical Training

The experience shall include all the essential elements of practical training stated in Section 4.

The Council would, **inter alia**, consider the following experience to be appropriate:

(a) Experience gained by a person appointed for a minimum of three years as a Manager or as an Engineer in terms of the Mines Health and Safety Act,1996 (Act No 29 of 1996), as an Engineer in terms the Occupational Health and Safety Act,1993 (Act No 85 of 1993) or as a Chief or Second Marine Engineer Officer on a vessel with a registered power of no less than 3000 kW in terms of the Merchant Shipping Act, 1951 (Act No 57 of 1951), or in terms of any Act which preceded or superseded any of the Acts mentioned above.

(b) In all cases mentioned above, the experience shall entail direct involvement in the solution of problems related to the installation, operation and/or maintenance of machinery which require sound engineering judgement and management.

(c) Experience gained in engineering design, draughting, problem solving, construction, training and management – project, construction, quality and general, provided that at least two of the required three years of experience are directly concerned with the installation, operation and/or maintenance of machinery which require sound engineering judgement and management and which demonstrates the applicant's competence at the required level of a certificated engineer.

(d) In the case of marine engineers, experience gained as the appointed Chief Marine Engineer Officer for five years, on a variety of vessels with registered power of no less than 2200 kW plus at least six months experience in an "acting" capacity as Supervising Marine Engineer will be considered in lieu of the experience specified in (a) above.

Note: Experience at the level of a mine captain / overseer / general engineering supervisor does not count as appropriate experience.

In evaluating an applicant's experience, Council takes the following aspects into consideration:

(i) the technological level at which the work was performed;

(ii) the level of technical and administrative responsibility reached by the applicant;

(iii) the measure of the variety of the tasks which were mastered within the branch of engineering or combination of branches;

(iv) applicable advanced studies which complement the work and which were completed before or during the applicable work experience ;

(v) the overall level of competency reached by the applicant.

3.3 Standard of Practical Training

3.3.1 Candidate Certificated Engineers (CCE's)

The standard required is that candidates must increasingly develop the ability to use their theoretical and practical knowledge to full professional level independently and without constant supervision. They should be capable of innovative planning, design and management. They must be able to provide proof that they can do their work with the necessary intellect, insight and methodical approach applicable to their category.

3.4 Continuing Professional Development (CPD)

CPD can be defined as "the systematic maintenance, improvement and broadening of knowledge and skills, and the development of personal qualities necessary for the execution of professional and technical duties throughout an engineer's career".

The principle to undertake CPD is included in the Engineering Profession Act, 2000 (Act 46 of 2000). At the time of registration, candidates will be assessed as having the professional competence to enable them to practice safely and effectively in their discipline of engineering. Professional Certificated Engineers are obliged to undertake CPD, the nature, range and extent of what is required varies with the work to be undertaken. Professional Certificated Engineers are required, at all times, to take all reasonable steps to maintain and develop their competence and knowledge in their field of professional activity. Moreover, they must not under any circumstances accept or undertake work which they do not have sufficient competence, time or authority to perform, unless the necessary advice, assistance or authority is obtained.

Any combination of the activities listed below will constitute CPD:

(i) Attending courses, seminars, congresses and technical meetings organized by Engineering Institutes, universities, other professional bodies and course providers.

(ii) Actively participating in conferences, serving on technical or professional committees or professional engineering institutes and working groups.

(iii) Undertaking structured self-study (i.e. using textbooks with examples).

(iv) Studying technical literature (e.g. journals, magazines)

(v) Taking correspondence courses and studying other supervised study packages.

(vi) Taking in-house courses provided by employers.

(vii) Enrolling for formal post-graduate studies.

(viii) Writing technical papers or presenting lectures at an organized event.

3.5 Lectureship

Council prefers that lecturers in engineering at universities, technikons and technical colleges and other approved engineering training establishments be registered as Professionals in order to foster the correct attitude amongst their students with respect to professionalism and registration.

To register professionally, lecturers should do some of the following practical engineering work in addition to their lecturing:

(i) consulting work with the accent on applicants taking full responsibility for it;

(ii) planning, design, development, commissioning and application associated with engineering projects;

(iii) be responsible for the management of workshops, laboratories and ancillary facilities; and

(iv) execution of engineering projects which include the application of essential practical training elements as detailed in Section 4.

Since lecturers cannot normally be involved in the above-mentioned engineering work on a fulltime basis the minimum experience will normally be five years after obtaining a recognised certificate of competency, but each application will be considered on merit.

3.6 Practical Training outside the Republic of South Africa

Applicants who received their practical training in engineering work abroad will be considered in accordance with the principles and requirements contained in this Policy Statement. Appointment in accordance with South African legislation as a Certificated Engineer will still be required, and in most cases, will not be possible beyond the borders of South Africa.

3.7 Date of Registration

The **"date of registration"** is that date on which Council decided to register an applicant. This is also the date which appears on all registration certificates. Of necessity, it is always later than the date on which application was made, as Council requires time to consider an application.

3.8 Interview

An applicant who has applied for registration as a Professional must attend an interview should Council so request. The purpose of this interview would usually be to establish the extent to which applicants meet the principles and requirements contained in this Policy Statement, the extent to which they benefited from their practical experience and whether they have accepted professional responsibility at the required level for their work, within the code of professional conduct. The interview may be converted into a professional examination.

3.9 Responsibility of Candidates

Candidates should appreciate that the onus rests on themselves to ensure that the training they receive will meet all the requirements set out in this Policy Statement. Council prefers that they follow a training programme under a Commitment and Undertaking Agreement (CU) which has been registered with Council and which, as is required, has at least one mentor registered in terms of the CU.

Should CCE's experience difficulties with their training, they should attempt to resolve them through the normal channels, for example with the mentors (see § 3.10) responsible for their guidance. CCE's must submit regular quarterly training reports to their supervisors/mentors, as arranged with their employer. The reports must clearly show the extent to which the requirements with respect to the essential practical training elements stated in Section 4 are met, as well as the extent to which they benefited from their practical training. The method and format used in these reports should be such that the persons in training find the reports useful when applying for registration as Professionals. The mentor shall be an appropriately registered person unless otherwise agreed to by Council.

The lack of training opportunities cannot be accepted as a reason for the lowering of the minimum standards set for registration.

3.10 Supervision of Candidate Certificated Engineers

(a) Internal Mentorship

Training should preferably be supervised by a person registered in an appropriate category of professional registration in the employing organisation who would be both guide and mentor to the CCE. All Professionals are under a moral and professional obligation to help with the training of CCE's, if at all possible.

The obligations of mentors in this regard are:

(i) agreeing to give guidance to CCE's regarding their career planning and professional development and to advise them on suitable training programmes which meet Council's requirements;

(ii) ensuring that CCE's are exposed to the essential practical training elements, as stated in Section 4;

(iii) facilitate conditions and measures in order for CCE's to develop independent thinking;

(iv) encouraging CCE's to work as team members;

(v) ensuring that CCE's are gradually exposed to increasing engineering responsibility and to work of increasing complexity;

(vi) ensuring that CCE's incorporate quality assurance techniques in their work;

(vii) ensuring that CCE's gradually be exposed to more comprehensive management tasks and that they are given responsibility for them;

(viii) receiving progress reports by CCE's and appraising them in a critical yet constructive manner;

(ix) evaluating and reporting on the progress which the CCE's have made during the period under their guidance and advising them if any deficiencies exist;

(x) ensuring that there is an equitable arrangement with the CCE's supervisor for access to the CCE, and to encourage the CCE to ensure that the requirements of this Policy Statement are met.

(b) External Mentorship

Should the services of an internal mentor not be available to an employer, the employer may use the services of an external mentor through one of the relevant recognised engineering institutes/bodies. Mentors thus appointed should be sensitive to any limitations which the employer may wish to set in any given situation.

External mentors have the same duties as an internal mentor, as stated in § 3.10(a).

(c) Supervision

Direct supervision of CCE's need not be the mentors' function. The supervisors of CCE's undertake direct supervision of their daily tasks under the general guidance of their mentors. The direct supervisors need not necessarily be persons registered in the categories required for mentors as indicated in § 3.10(a).

3.11 Responsibility of Employers

It is recommended that employers of CCE's, as a matter of policy, draw up a training programme in accordance with Section 4.

The employers are expected to ensure that CCE's are always under the guidance (not necessarily the direct supervision) of a mentor in their employ, as stated in § 3.10. If employers do not have suitable persons as internal mentors in their employ, they must ensure that external mentors be appointed, as stated in § 3.10.

3.12 Application for Registration as a Professional Certificated Engineer

It is essential that applicants for registration as Professional Certificated Engineers provide detailed information (with dates in chronological order) about their personal specific involvement and responsibility in engineering tasks or engineering projects. Supporting documentation for the most important of these projects in respect of each phase of training must be presented in date order. It is important that the level of responsibility reached in each phase is clearly stated.

The prescribed application fee must accompany the application.

3.13 Code of Professional Conduct

It is of the utmost importance that CCE's, throughout the practical training period, remain aware of, and act according to, the code of professional conduct for the engineering profession as contained in the rules in terms of the Engineering Profession Act, 2000 (Act No. 46 of 2000), a copy of which is obtainable from the Council's offices. The code of conduct will also be forwarded to each person upon registration as a Candidate Professional Certificated Engineer.

SECTION 4

4. Practical Training Programmes

4.1 An acceptable practical training programme should contain an undertaking that the employer will provide practical training to meet the requirements of the principles contained in this Policy Statement.

Such a practical training programme for CCE's should include the following:

(a) an indication of the time to be spent on each essential practical training element and the level of responsibility and competency envisaged ;

(b) the level of personal and specific technical involvement in each practical training element ;

(c) the guidance that the mentors/supervisors will be giving the CCE ;

(d) the training reports that will be expected from the CCE's and from the mentors/supervisors and other personnel involved on a regular basis (at least quarterly), as described in § 3.10.

(e) An appendix may be added in which the envisaged engineering work is set out.

4.2 The general planning and co-ordination of the practical training should be under the guidance of a mentor who should preferably be a senior Professional in the appropriate category in the employer organisation. See § 3.10 for further information on the duties of internal and external mentors.

4.3 A record of the practical training should be kept. The record should indicate the extent to which the work meets the requirements of acceptable practical training.

4.4 Individual practical training programmes should contain a clear statement reminding CCE's that the onus rests on themselves to ensure that the practical training they are receiving will meet the requirements contained in this Policy Statement.

4.5 In cases where employers of CCE's are unable to provide complete training as described in this Policy Statement, consideration should be given to the secondment of CCE's to other employers for this purpose.

SECTION 5

5. TRAINING PROGRAMMES AND MENTORS

5.1 The approval of training programmes by the previous South African Council for Professional Engineers (SACPE) started many years ago. For a programme to be approved, the employer concerned had to show that it would provide work of sufficient variety and standard to satisfy the general requirements of SACPE for each discipline. In addition, a general outline had to be given on the path of training a candidate would follow together with the time spent in each portion of the programme.

5.2 Experience has shown that, with the exception of a few industries, the system of approving training programmes did not necessarily produce the desired results, mainly because factors such as the state of the economy at any given time dictated the extent to which employers were able to train their CCEs to meet ECSA's standards. Programmes were accordingly not strictly adhered to, thus diminishing the justification for a comprehensive and time consuming system of approval by ECSA. This, amongst others, prompted ECSA to seek other approaches which would allow sufficient flexibility, whilst maintaining (if not strengthening) the commitment of employers and CCEs to training and professional development.

5.3 After due consideration ECSA accepted the following points of departure:

(a) ECSA will not be prepared to reduce standards by registering persons who, through force of circumstances beyond their control (ie. state of the economy), could not be trained in accordance with ECSA's requirements.

(b) CCEs are in any event strongly discouraged from applying for registration until they clearly meet all the requirements, regardless of the time taken to do so.

(c) Employers should be expected to provide maximum opportunity for training, given practical and financial constraints, and to ensure regular interaction between CCEs and their mentors. A list of mentors should be established which would enable ECSA and the Institutes to maintain contact with mentors and to keep them abreast of the requirements.

(d) The level of commitment on the part of CCEs and their employers, towards achieving the desired levels of competence should determine the rate of their progress towards professional registration.

(e) The Council will maintain its established policy, namely "When in doubt about the registerability of an applicant, refuse the application". This policy is dictated by ECSA's statutory responsibility to ensure that public interest, safety and health is safeguarded. Whilst ECSA will do everything in its power to provide applicants a fair opportunity to prove their competence, minimum standards will not be compromised.

5.4 An official register was accordingly established in which a commitment and undertaking (C&U) will be registered by ECSA for all employers who apply for such registration. The system will involve the following:

Definitions

5.5 In this context the word -

"commitment" refers to the expressed resolve on the part of employers as an indication of their alignment with, and substantive support for, one of the ideals of the profession, namely that every possible opportunity, support and guidance should be afforded to CCEs during their period of training and professional development; and

"undertaking" refers to employers' expressed resolve to give effect to their commitment to the best of their ability.

5.6 In short, the implications of these "expressions of intent" will be that employers will be required to -

(a) structure the training of, and actually train, their CCEs, in accordance with the requirements of this Policy Statement as well as the relevant discipline specific guidelines, and

(b) provide regular guidance to their CCEs through mentors.

"Training under a C&U"

5.7 Upon registration of a commitment and undertaking (C&U), employers will be expected to ensure that all the essential elements referred to in Policy Statement R2/1D have been addressed at the end of the training period.

5.8 It should be noted that by registering a C&U, employers are not discouraged from drawing up more detailed programmes appropriate to their own circumstances. In fact it is highly recommended that they do so because it represents an internal management tool to achieve the stated objectives outlined in Policy Statement R2/1D. ECSA has indicated its continued preparedness to assist employers in drafting their programmes, although such programmes will not be registered.

5.9 Each C&U has a permanent registration number allocated, which should be quoted by all persons when applying for registration as professional engineers.

5.10 By quoting the C&U's registration number on the application, those registered as CCEs will benefit because ECSA's approach to the evaluation of such applications will change. In essence the emphasis will shift from a "first principle" approach aimed at a fundamental assessment of an applicant's functional ability against all the requirements, to a "quality assurance" approach, which is aimed at verifying whether, and to what extent, the CCEs training was structured in accordance with the requirements.

5.11 ECSA requires an employer's Chief Executive Officer to register the C&U. Since ECSA views these "expressions of intent" as vitally important, it must be satisfied that they not only represent corporate policy, but also that top management assumes ultimate responsibility for the proper implementation of this policy. It will accordingly be expected that CEOs issue the necessary directives to those charged with this responsibility.

5.12 The credibility of employers' C&U will be measured through an ongoing verification process where the quality of applicants' training and the level of their professionalism will be assessed. The reward will normally be that CCEs become registered in the shortest possible time after obtaining their qualification (ie three to four years). In the case of an employer's consistent failure, or inability, to honour its C&U, the situation can arise where ECSA may have no alternative but to deregister such employer's C&U.

Mentors

5.13 Employers must, when registering a C&U, confirm the availability of a mentor within the organisation, or expressly undertake to arrange an external mentor to guide their CCEs through the required process of training.

5.14 A C&U will not be registered by ECSA unless at least one mentor (internal or external) is listed against that C&U. It will be the responsibility of the listed mentors to advise Council of their movements should their association with an employer and the particular C&U, in respect of which they had been registered, be terminated.

5.15 ECSA will only accept registered persons for purposes of listing. It will be expected of a listed mentor to demonstrate the necessary commitment and to accept professional responsibility for fulfilling this function. Guidelines for mentors are available for each discipline of engineering and can be downloaded from ECSA's website at www.ecsa.co.za.

5.16 A mentor should ideally be in the service of the employer whose CCEs require mentoring, and should be sufficiently senior to be able to influence decisions in the organisation. If a professional certificated engineer is not available internally, employers are required to procure the services of an "external" mentor. ECSA and/or the relevant institute can be approached to assist in identifying a suitable person. While it is recognised that employers may be sensitive to "interference" from outside, it is strongly recommended that employers and external mentors define the latter's jurisdiction at the earliest opportunity.

5.17 ECSA will maintain a list of internal mentors.

5.18 A mentor must be registered as a professional certificated engineer or professional engineer.

5.19 A mentor should not be confused with a "referee" or a "supervisor". The mentor should be a person who is able to provide guidance and professional support to CCEs. Mentors need not necessarily be directly involved in the day-to-day supervision of CCEs, whereas supervisors are persons who interact daily with CCEs. It is, however, possible that the mentor can also be the supervisor. The referee is normally a person who is called upon to provide an opinion on an applicant's professionalism at any particular stage during a CCEs training. A referee does not carry any responsibility for guiding CCEs in their professional development. They happen to be persons who are well placed to express an opinion without necessarily having a holistic view of an applicant's training. It is possible that a referee can also be a mentor or a supervisor.

An example of the C&U appears below:

COMMITMENT AND UNDERTAKING (C&U)

I the undersigned, _____, in my capacity as _____ of hereby wish to register our commitment and undertaking (C&U) to structure the training of, and actually train, our candidate certificated engineers in accordance with the requirements of ECSA's Policy Statement R2/1D.

I hereby confirm that it is our expressed intention, in so far as we are able to do so, to encourage our engineering graduates to register as candidate engineers and to provide them every possible opportunity to achieve the standard of professionalism required by ECSA.

**The professionally registered engineering practitioners referred to in the attached Annexure have been identified from within the organisation to act as internal mentors in accordance with the guidelines set out in Policy Statement R2/1D.*

**Since we do not have a person on our staff who qualifies for internal mentorship, the following person(s) has/have been appointed as external mentor(s) for our candidate certificated engineer(s) and we undertake that we will create an environment which is conducive to effective liaison between our candidate certificated engineer(s) and the external mentor(s).*

We hereby undertake that, in the event that any one, or more, or all of the mentors referred in this application should leave our employ, or be unable to fulfil their functions as mentors, we will immediately advise the Council of any such change and provide the name(s) of any replacement(s).

We understand and accept that ECSA has the discretion to deregister this C&U should the training provided by this organisation not satisfy ECSA's requirements, provided that ECSA shall have given reasonable notice of its intention to do so and have given reasonable time in which any deficiencies should be rectified.

** Delete whichever is not applicable*

Copies of the Commitment and Undertaking are available from ECSA's offices.

Engineering Council of South Africa

Discipline Specific Guidelines: Mining Engineering

Acceptable Training for Registration as Professional Engineers

It is recommended that Candidate Engineers(Ces) provide a copy of this document to each supervisor of their training and to each of their referees.

1. Introduction

These guidelines are aimed at providing more information about the requirements for registration through the Engineering Council of South Africa (ECSA) in addition to the broader requirements set out in Policy Statement R2/1A.

1.1 Candidates wishing to become registered as professional engineers with ECSA must:

(i) hold a relevant academic qualification recognised by ECSA through accreditation or evaluation, or pass any examination which ECSA may prescribe; and

(ii) demonstrate that they have been trained to an acceptable level of competence in defined elements, in so far as it relates to mining engineering, for at least three years; and

(iii) display the attributes of a professional person.

1.2 Immediately upon graduation, candidates are encouraged to apply to ECSA for registration as candidate engineers (CEs), whereafter they will be provided with all relevant documents needed for the complete training period.

1.3 The recommended way of achieving the requisite levels of competence in all the training elements is through a focused and collaborative process of acceptable training, where the CEs and their employers (mentors) plan and execute the actual training on the basis of ECSA's Policy Statement R2/1A, as well as the training objectives listed in these Discipline Specific Guidelines.

1.4 CEs will be expected to gain practical experience in a position of responsibility and to prove that their education, training, experience and professional development have enabled them to discharge, in full, the responsibilities of a professional engineer in mining engineering.

2. Academic Qualifications

2.1 The minimum academic qualification required for registration as a CE is an accredited bachelor's degree in mining engineering, accredited by the Engineering Council of South Africa.

The list of South African bachelor degrees in mining engineering, accredited by ECSA, may be obtained from the Education Department of ECSA at:

Tel:	**(011) 607-9500**	or in writing at:	**Private Bag X691**
Fax:	**(011) 622-9295**		**Bruma**
E-mail:	**engineer@ecsa.co.za**		**2026**
Web:	**www.ecsa.co.za**		

2.2 Persons who have graduated from a university not accredited by ECSA will be assessed individually on merit. If their qualifications are evaluated as being at least equivalent to an accredited South African degree, candidates will be eligible for registration as CEs and could then follow the formal route to registration as professional engineers.

2.3 Persons whose qualifications are not accredited or recognised by ECSA may follow an alternative route to meet the academic requirements for registration as CEs. Candidates must apply to ECSA and obtain the necessary information on the procedure to be followed.

2.4 Those who meet ECSA's academic requirements should register as CEs without delay. Application forms can be obtained from ECSA. CEs must, from the outset, also obtain copies of the application form for registration as professional engineers.

3. Training and Professional Development under a Commitment and Undertaking (CU), and Mentorship

Commitment and Undertaking (CU)

3.1 CEs must persuade their employers to register a Commitment and Undertaking with ECSA, namely that they will structure the training of, and actually train, their CEs, in accordance with the requirements of ECSA's Policy Statement R2/1A as well as the requirements set out in these Discipline Specific Guidelines. Each CU will be allocated a permanent registration number, which should be quoted by all CEs when applying for registration as professional engineers.

3.2 Employers must, at the same time, submit the name(s) of a mentor(s) from within the organisation (see § 3.4 below) or, if an internal mentor is not available, the name of an external mentor (see § 3.5 below) to guide CEs through the required process of training. A CU will not be registered by ECSA unless the name of at least one mentor (internal or external) is provided.

Mentorship and Supervision

3.3 ECSA and the Institute of Mining and Metallurgy (SAIMM) will jointly maintain a list of internal and external mentors. A mentor must be registered as a professional engineer. Council will only in exceptional cases consider the listing of experienced and mature professional engineering technologists, professional certificated engineers, or professional engineering technicians, upon application and motivation by the organisation/mentor concerned. These mentors will be deemed not only to be capable of fulfilling their functions in a professional manner but also as being committed to advising and guiding their CEs in their professional development.

3.4 It is STRONGLY RECOMMENDED that all CEs should have a mentor who is working in the same organisation as the CE.

3.5 If a mentor is not available internally in the organisation, a list of external mentors can be obtained from ECSA or SAIMM. It will be expected of employers who make use of the services of external mentors to create an environment in which such mentors can feel free to make recommendations in the reasonable knowledge that their recommendations will be given sympathetic consideration.

3.6 It will be expected of all mentors to become fully conversant with their functions and responsibilities referred to in Policy Statement R2/1A and guidelines issued by ECSA from time to time, to conduct regular discussions with their CEs and to assess their progress in accordance with the guidelines set out in Policy Statement R2/1A and these Discipline Specific Guidelines. Since the effectiveness of mentors will be monitored continuously, Council will attach much value to the opinion of "the conscientious mentor" as to the registrability (or otherwise) of their CEs.

3.7 It is not expected of mentors to take responsibility for the day-to-day supervision and training of CEs. Mentors/employers should, however, do everything in their power to ensure that competent persons, preferably registered with ECSA, are available to oversee this function.

4. GENERAL

4.1 Training reports, which must be updated regularly, form an essential part of the monitoring process, and these reports must be filled in on the correct forms (Forms A2.1 and A2.2) of the application form. These forms should be obtained from ECSA as soon as the CEs start their training.

4.2 It is a requirement that CEs who are aspiring to become professional engineers should, with the assistance of their mentors, achieve their training objectives by structuring their training in such a way as to cover the various elements of training referred to in Policy Statement R2/1A and these Discipline Specific Guidelines.

4.3 The rate at which CEs progress through their training is determined by themselves, their mentors and other factors, such as the state of the economy and availability of training opportunities.

4.4 Where CEs, training under a CU decide to change employers, they should ensure that they continue their training under another CU registered with ECSA by their new employers. CEs should also ensure that their new employers provide mentors to guide them through the remainder of their training period and to take over where the previous mentor ended. It may even be advisable to retain the previous mentor, if this is at all practicable.

4.5 Once all the objectives have been achieved to the satisfaction of the mentor, CEs should, in principle be registerable, and could then apply for registration as professional engineers. Depending on the circumstances, CEs may expect to take a minimum of three years to achieve acceptable competence in all the prescribed elements.

4.6 Regardless of whether or not CEs train under a CU, it is recommended that they strive to participate in a process of continuing learning. This concept includes continuing education and professional development.

4.7 Continuing learning may include the attending of courses, technical conferences, seminars, symposia, organised site visits, as well as meetings of professional bodies and self-study. The programme of continuing learning should achieve a balance between technical content and managerial/professional aspects.

4.8 The mentors of CEs should, on a consultative basis, suggest suitable continuing learning programmes.

4.9 SAIMM and educational institutions may be able to assist in advising on courses which are available.

4.10 It will be to the advantage of CEs when applying for registration as professional engineers if they can demonstrate their participation in a process of continuing learning.

5. Professional Attributes

The following attributes are considered common to all professional engineers and the requirements for these attributes are designed to ensure that CEs acquire competence with respect to professional responsibility in decision making, engineering judgement, leadership, communication and an appreciation of their own professional and working environments.

5.1 Professional Responsibility

CEs must ensure that their work reaches a level of responsibility commensurate with that which ECSA would normally expect of an engineer with three years post-graduate experience, both in terms of the type and level of work being performed. This means that responsibility for directing personnel, money and materials must be taken during the execution of a project, or part of a project. When applying for registration as a professional engineer, CEs must demonstrate their ability to work satisfactorily on their own, that they have taken responsibility and, in having done so, achieved a satisfactory outcome.

To satisfy this requirement applicants should have completed one or two projects where their engineering ability will have been tested. A project report or reports must be submitted on **Form AF7** with the CE's application. It should clarify the depth of their role in the project and provide the background to important decisions for which, they were responsible. It must also indicate any financial or economic considerations the project has had on operations. The report should be brief and incorporate drawings, numerical analysis and cost data.

5.2 Engineering judgement displayed in practical application

When applying for registration as professional engineers, CEs must demonstrate that their engineering work required them to –

- exercise independent technical judgement, combining their experience and application of engineering principles;
- accept responsibility for such decisions; and
- understand and take into account financial, economic, commercial and statutory considerations.

5.3 Communication Skills

CEs must develop the ability to communicate lucidly, accurately and with confidence. ECSA will base its assessment of CEs communication skills on the quality of the application presented.

5.4 Professional Environment

To a large extent this will be covered, provided applicants have obtained a Certificate of Competency in the field of Mining Engineering i.e. Mine Managers, Survey, Rock Mechanics, Environmental Control, etc.

CEs must, when reporting to their mentors on a regular basis, and in discussions with them, demonstrate that they have:

- a general understanding of engineering procedures applicable to their discipline of engineering;
- a general knowledge of legislation which has a bearing on the practice of engineering in South Africa, with a detailed knowledge of the important sections of the Engineering rofession Act, 2000 (Act 46 of 2000) and the Acts and Regulations applicable to their specific discipline of engineering;
- an understanding of the Code of Professional Conduct applicable to registered persons;
- an understanding of the purpose of and relationship between the various organisations involved in their discipline of engineering; and
- full familiarity with the requirements for registration set out in Policy Statement R2/1A as well as these Discipline Specific Guidelines.

6. Discipline Specific Elements

Each heading should have been covered but not necessarily all the supplementary elements mentioned after each heading. It should be demonstrated that the CE has become a well-rounded Engineer.

MINING ENGINEERS

Those engineers whose training has been concerned with the production process should demonstrate that they have obtained experience in:-

1. **Production** - General Mining Processes including Health and Safety.
2. **Planning & Design** - To be covered in project report.
3. **Project Work / Research** - See Form AF7 attached to this document.
4. **Technical Services** - Study Survey and Ore Evaluation, Ventilation, Rock Mechanics, Benefication, Geology, Grade Control and Administration.
5. **Supervisory Experience** - Shift boss, Mine Overseer or equivalent.

ROCK ENGINEERS

Those Engineers whose training has been concerned with Rock Mechanics should demonstrate that they have obtained experience in:-

1. **Basic Mining** - General Mining Processes including Health and Safety, Support

Installation and Rock Stability.

2. **Project Work in Rock Mechanics** - See Form AF7 attached to this document.
3. **Design in Rock Mechanics** - Optimisation of mining layouts, Computer applications in Rock Mechanics.

4. **Supervision of Rock Mechanics** - Support installation in a supervisory capacity, e.g. Shift Boss / Mine Captain equivalent maintenance and monitoring of support installations.

ENVIRONMENTAL

Those Engineers whose training has been concerned with the ventilation of mines should demonstrate that they have obtained experience in: -

1. **Basic Mining** - General Mining Processes including Safety and Health.

2. **Project Work** - See Form AF7 attached to this document.
3. **Mine Environment Design & Specification** - Layouts, Cooling, Fan specifications.

4. **Supervision of Ventilation** - Controlling and monitoring dust, air control, fumes and gasses in a section of a mine, installation of fans, air conditioners, etc.

5. **Installation** - Of Fans, Air Controls, Brattices, etc.

MINERAL EVALUATIONS

Those Engineers whose training has been concerned with the evaluation of ore deposits should demonstrate that they have obtained experience in: -

1. **Basic Mining** - General Mining Processes including Safety and Health.
2. **Tonnage / Grade Estimates** - Sampling, Regression, Geostatistics, Kriging, Geology, Sedimentology on Evaluation process.

3. **Planning** - Impact of Mine layouts on the Evaluation Process, Rock Mechanics.

4. **Survey** - Appreciation of survey techniques and interpretation of mine plans.

5. **Project Work** - See Form AF7 attached to this document.
6. **Economic Evaluation** - Costs, Revenue, Pay Limits, Life of Mine calculations, Cash Flow Estimates, Rate of Returns, etc.

Engineering Council of South Africa (970731) **Form AF7**

Project Executive Summary Report: Mining Engineering

Use this form to report on a project to which you have made a significant contribution. Use a new form for each project. At least one, but not more than three projects.

Name: _____ Application Ref. No:_____

Project name and date(s)	
Engineering brief and Objective	
Environment *(Industry; Laboratory; Theory; Simulation)*	
Summary *(State engineering problems; solutions)*	
Your contribution to the project *(State aspects of engineering judgment)*	
Title of report or publication	
Budget	

Signature of Applicant: _____

Date: _____

Signature of Supervisor: _____