

Discipline Specific Guidelines: Aeronautical 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 at 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 aeronautical 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 aeronautical engineering.

2. Academic Qualifications

- 2.1 The minimum academic qualification required for registration as a CE is a bachelor's degree appropriate to the aerospace industry, accredited by the Engineering Council of South Africa.

More information regarding recognised or accredited qualifications can be obtained from the Education Department of ECSA either telephonically at:

Tel: (011) 607-9500
Fax: (011) 622-9295
E-mail: engineer@ecsa.co.za
Web: www.ecsa.co.za

or in writing at:

**Private Bag X691
Bruma
2026**

- 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 South African Institute of Aerospace Engineering (RAeSSA) 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 RAeSSA. 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 do everything in their power to ensure that competent persons, preferably registered with ECSA, are available to oversee this function as supervisors.

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 registrable, 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 process 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 RAeSSA 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.

CEs must show that they are capable of integrating their knowledge and practical training and that they are able to make effective engineering decisions to solve problems, as well as able to lead the engineering teams involved in carrying out their decisions.

Other primary essential professional attributes sought in aeronautical engineering are:

- (i) a thorough understanding of the Quality Assurance process, which extends from project or product inception to Life Cycle Support;
- (ii) an ability to control expenses as well as subordinate engineers to the extent that costs are kept within budget and that milestones are met through tailoring the engineering effort necessary to achieve the technical goals of a programme; and
- (iii) an understanding of the aeronautical product in terms of it being a synthesis of engineering systems and the concept of achieving technical milestones through the use of established and proven technologies.

Naturally for engineers working in a research environment para (iii) above may not always be uppermost in their minds. The conservative, safety conscious nature of aeronautical engineering, must however, be understood by applicants.

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.

Technical expertise will be proven by successfully solving problems related to design, development, operation and maintenance of aeronautical engineering applications.

Applicants should also illustrate the extent to which they had direct responsibility for the management or guidance of technical staff and other resources.

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

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 Profession Act, 2000 (Act 46 of 2000), and the Acts and Regulations applicable to their specific discipline of engineering;
- 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

Many engineers in the aerospace industry, particularly those working in a highly technical environment, tend to become specialists. Those working in areas such as manufacture, maintenance and project management tend to be generalists. Specialists, through their interaction on projects with those working in other specialist areas, should as a consequence gain practical experience in other areas of expertise.

Those aeronautical engineers whose training has been more general should demonstrate that they have acceptable experience in a number of specialist areas (typically 5) for a minimum period of three years. Specialist aeronautical engineers however, should demonstrate that they have had in-depth experience, typically five years, in at least one area of aerospace engineering and acceptable experience in a number of other areas. (See para 3.6.1 on page 6 of Policy Statement R2/1A).

Typical aerospace specialist areas are:

- Aircraft design
- Aircraft structures
- Aircraft propulsion systems
- Aerodynamics
- Avionics
- Aero-elasticity
- Stability and control
- Aircraft systems including hydraulic, pneumatic and avionic systems
- Wind tunnel testing
- Flight testing
- Aircraft performance monitoring
- Airport/Airfield management
- Certification and system safety programmes

7. Documentation

Details of the training received by all CEs is to be recorded in an appropriate manner, which will clearly indicate:

- Projects in which the CE was involved
- The duration of each project
- The work carried out by the CE
- The responsibility of the CE
- The extent to which training was obtained on each of the professional attributes viz:
 - Professional responsibility and leadership
 - Technical ability
 - Engineering judgement and decision-making
 - Communication
 - Professional environment / socio-economic responsibilities
- The extent to which training was obtained on discipline specific elements.