MALAWI ENGINEERING INSTITUTION

GUIDELINES FOR GRADUATE ENGINEERS AND MENTORS.

October 2022

EXECUTIVE SUMMARY

One of the observations made by the Malawi engineering fraternity is the need for a smooth training guideline of the engineering graduate towards professional class registration. This document, therefore, presents the guidelines that should followed by the mentor and graduate engineer (mentee) as they commence and progress on the training programme towards professional registration.

The guideline groups the development process of the engineering graduate into four stages, namely the academic attainment stage, the registration stage in the class of Graduate Engineer, the professional competency attainment towards Professional Registration and the maintenance of the competency through continued professional development (CPD) programme.

In order to be judged competent to register in a professional class, the guideline defines eleven (11) outcomes that must be achieved at the level stated. These outcomes are conveniently grouped into five sets namely knowledge-based engineering problem-solving, managing engineering activities, impacting of engineering activity, exercising judgement, take responsibility and act ethically and Continuing Professional Development. Progression throughout the training period is categorised into the following degrees of responsibility: Being exposed, Assisting, Participating, Contributing and Performing. Such training program is expected to last for at least 2 years and preferably for a maximum of 5 years.

The guidelines also stipulate the roles to be played by the mentor as well as the mentee. It further presents assistance to the graduate engineer and the mentor in the planning of the programme and the progression of the graduate engineer. It encourages the graduate engineer to take ownership of the program and ensure that training records are well kept. In an event that the graduate engineer's training programme is not progressing due to the graduate engineer's lack of effort, interest, or other, or where the graduate engineer fails to demonstrate attainment of competence after a period of 5 years, or indeed where the mentor consistently demonstrates lack of interest, unconcern behaviour, perpetual delays in executing his/her duties, the guidelines give powers to the ERC to take appropriate action on the mentee or the mentor respectively.

With these guidelines, the ERC expects that mentorship programmes for graduate engineers shall indeed progress smoothly with little challenges if any.

Signed:

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Chairman – Engineering Registration Council

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DEFINITIONS

i. **Applicant**: A person applying to the Engineering Registration Council (ERC) of the Malawi Engineering Institution (MEI) for registration in a professional class.

ii. **Benchmark Route**: The normal process to attain registration consisting of completion of an accredited, recognized or evaluated substantial qualification and a well-structured and effectively executed programme of training and experience for the professional class of registration.

iii. **Competency Standard**: Statement of competency required for a defined purpose

iv. **Engineering problem**: A problematic situation that is amenable to analysis and solution using engineering sciences and method.

v. **Engineering science**: A body of knowledge based on the natural sciences and using mathematical formulation where necessary that extends knowledge and develops models and methods to support its application, to solve problems and to provide the knowledge base for engineering specializations.

vi. **Graduate Engineer**: A person who is registered with the ERC in a Graduate Class of registration.

vii. **Integrated performance**: An overall outcome of an activity that has several outcomes. For example, a design will require analysis, synthesis, analysis of impacts, checking of regulatory conformance and judgement in decisions.

viii. **Level Descriptor**: A measure of performance demands at which outcomes must be demonstrated.

ix. **Mentee:** A person who is under the guidance of a mentor.

x. **Mentor**: A professionally registered person who guides the competence development of an applicant in an appropriate class.

xi. **Outcome**: A statement of the performance that a person must demonstrate in order to be judged competent at the professional level.

xii. **Practice area**: 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

xiii. **Specified Category**: A class of registration for persons who are licensed through the Malawi Engineering Institution or a combination of the Malawi Engineering Institution and external legislation as having specific engineering competencies relating to an identified need to protect the public safety, health and interest or the environment in relation to an engineering activity.

xiv. **Sydney Accord**: An international agreement between the bodies responsible for accrediting engineering technology academic programmes.

xv. **Undertaking**: Employers' and mentors' expressed resolve to give effect to their commitment to the best of their ability.

xvi. **Washington Accord**: An international accreditation agreement relating to undergraduate academic degrees in professional engineering between the bodies responsible for accreditation in its signatory country and region.

ABBREVIATIONS

CPD Continuous Professional Development

CU Commitment and Undertaking

ERC Engineering Registration Council

GE Graduate Engineer

MEI Malawi Engineering Institution

IPD Initial Professional Development

SC Specified Category

TER Training and Experience Report

1 INTRODUCTION

These guidelines are for Mentors and Graduate Engineers as they walk through a training programme to achieve Professional Registration through the Malawi Engineering Institution (MEI).

It is mandatory for an engineering graduate to be registered as a Graduate Engineer with ERC, and preferably, to do his/her training with an employer.

As GEs are individuals, they are unique and should be respected as such. Each GE will have his/her own qualities, aspirations, etc. and his/her training should take these and any other relevant factors into account. These guidelines cannot therefore be prescriptive. These guidelines describe the process of training towards registration and the requirements that must be met. This guide, therefore, is designed for two main audiences:

- Persons who are registered graduate engineers and are in the process of registering in a professional class
- Mentors who support the graduate engineer's training.

2 DEVELOPMENT PROCESS OF THE ENGINEERING PROFESSIONAL

The main stages in the development of an engineering professional are described below. This guide applies to the development process between graduation with an accredited or recognised qualification and application for registration as a professional engineer. The development of an engineering professional is divided into four stages:

- Stage 1: Meet standard for engineering education
- Stage 2 Register as graduate engineer with MEI
- Stage 3: Meet the professional competency requirements for registration as a Professional Engineer
- Stage 4: Maintain competency through Continuing Professional Development (CPD) and observe the code of conduct

During **Stage 1**, a person undergoes training to meet the engineering educational requirements of a MEI accredited programme or qualification. This is the first critical stage towards the development of knowledge and competency necessary for registration as a professional. At the end of this stage, the person qualifies as an engineering graduate.

By **Stage 2**, the engineering graduate is registered as a graduate engineer. In this guide, a person working towards professional registration is referred to as a graduate engineer. Registration as a graduate engineer after graduation is a must.

During **Stage 3**, ERC assigns a Mentor to the graduate engineer. A programme of training and experience that is designed to develop a person is discussed between the Mentor and the Graduate Engineer.

During the period of training and experience, the person is in employment and works with and under the supervision of qualified engineering professionals. The training process may involve structured activities that include induction and training courses on specific skills or technologies. The graduate engineer also participates in self-initiated professional development activities, which are termed *Initial Professional Development* (IPD) activities. This is the stage where the graduate engineer develops the professional competencies required for professional registration.

During **Stage 4**, the person is now registered as a Professional Engineer. The requirement in this stage is that competency is maintained through CPD and both the code of conduct and the code of practice are observed. The renewal of professional registration is annually.

3 PROFESSIONAL COMPETENCY AND COMPETENCY STANDARDS FOR REGISTRATION

Professional competence means having the necessary attributes to perform the activities within the profession to the standards expected in independent employment or practice. The Malawi Engineering Institution Act, No. 13 of 2019 uses a competency-based approach to registration.

3.1 What is a Competency Standard?

Competence of an Engineering Professional in a class is defined as having the necessary attributes to perform the activities within the professional class to the expected standards. The Competency Standard defines a number of outcomes that a person must achieve. In order to be judged competent to register in a class, the outcomes must be achieved at the level stated. Eleven outcomes are defined and these are conveniently grouped into five sets.

Group A: Knowledge-based engineering problem-solving

- Outcome 1: Define, investigate and analyse engineering problems
- Outcome 2: Design or develop solutions to engineering problems
- Outcome 3: Comprehend and apply knowledge: principles, specialist knowledge, jurisdictional and local knowledge

Group B: Manage engineering activities

- Outcome 4: Manage part or all of one or more engineering activities
- Outcome 5: Communicate clearly with others in the course of his/her engineering activities

Group C: Impacts of engineering activity

- Outcome 6: Recognise and address the reasonably foreseeable social, cultural and environmental effects of engineering activities
- Outcome 7: Meet all legal and regulatory requirements and protect the health and safety of persons in the course of his/her engineering activities

Group D: Exercise judgement, take responsibility and act ethically

- Outcome 8: Conduct engineering activities ethically
- Outcome 9: Exercise sound judgement in the course of engineering activities
- Outcome 10: Be responsible for making decisions on all or part of engineering activities

Group E: Continuing Professional Development

- Outcome 11: Undertake sufficient professional development activities to maintain and extend his/her competence

3.2 How is competency demonstrated?

According to Section 2 of these guidelines, the first stage towards demonstrating competency is the attainment of an educational qualification; this is an important foundation. During the training and experience phase, the graduate engineer progressively performs more demanding work and assumes more responsibility. At Stage 2, the graduate engineer should be working at the level expected of a person who has newly registered but is still under the supervision and control of a registered person.

While working at Stage 2, the graduate engineer will be undertaking work that requires problem analysis and solution, accounting for impacts and regulation, managing processes to ensure that the engineering goals are met, behaving ethically, exercising judgement in decision-making and taking full responsibility to the mentor for the work completed. Effective performance of this work is, therefore, evidence of competence. The applicant must document this evidence for the registration application and must undergo documentary interactive assessment by engineering professionals who judge the demonstrated competency against the defined standards.

4 TRAINING THROUGH A CANDIDACY PROGRAMME

A candidacy programme normally commences when the engineering graduates from an accredited or recognised programme, registers as a graduate engineer and enters employment with an employer who is committed to training persons towards registration.

The minimum duration of a candidacy programme is at least two years. The final level of competence must be that defined in the standard for the professional class.

The objective of the programme is through training, experience and IPD, to attain the level of competence for professional performance in terms of skills, experience as well as ethical and professional conduct. Initial Professional Development consists of activities identified as meeting the post-registration CPD requirements but carried out before registration.

4.1 Process of training and experience

Training is the process of attaining specific practical knowledge, skills, attitudes and values under the direction of competent persons. Training may be supported by formal courses and other learning activities. The majority of training time is spent in engineering work. Experience is the process of gaining competence by active involvement in the engineering work environment. The trainee should register as a graduate engineer upon graduation from an accredited or recognised educational programme.

The process is governed by standards, policies and procedures. The graduate engineer engages in a quarterly phase of activities that may be the completion of a particular aspect of training or a unit of work. For each of the development phases, the graduate engineer, working with the mentor, sets and documents the competency development objectives of the phase. At the end of the phase, the graduate engineer and mentor review the achievements of the just-completed phase against the objectives that were set for the phase. Thereafter, objectives are set for the next phase. After completion of all phases of working as agreed at the beginning of the training process, the mentor and graduate engineer may determine that sufficient evidence of competence has been accumulated to apply for qualifying examinations, provided that the two-year minimum period has elapsed. The mentee then fills an application form for qualifying examinations and submits evidence of competency.

4.2 Roles and responsibilities of mentors and Mentees (Graduate Engineers)

4.2.1 Background

It is essential that Mentors are completely familiar with the contents of all the documents referred to in the Preamble. Mentors must be fully committed to the outcomes-based philosophy and in addition have a thorough understanding of the principles outlined.

Professional Registration is the point at which the level of competence will have met the prescribed requirements for registration. It is therefore vital that the registration process functions effectively to ensure that only individuals who are fully competent and have the required degree of professionalism become registered. ***The image and status of engineers is determined by the manner in which engineers conduct themselves in society (both***

individually and collectively) and the future of the profession will to a large degree depend on the qualities of individuals entering the profession.

In terms of the process that has been developed for the registration of engineers, the Mentor is the person (apart from the GE) who will play the most significant role in ensuring that each GE who applies for professional registration has developed and acquired the necessary range and level of competencies.

When processing the GE's application, the ERC will place much value on the opinion of the Mentor as to the registrability of the GE.

4.2.2 Roles and Responsibilities

The **Mentor** should maintain an overview of the training programme and the movement of the GE through this programme.

The Mentor's roles and responsibilities are as follows:

a) Development of a Training Programme.
b) Assist each GE for whom the Mentor is responsible with the development of his/her Training Plan and through monitoring assist him/her in continuously reviewing the plan and implementation thereof to ensure he/she acquires at least the required range of competencies and to the required level.
c) Compile a training completion report.

While the GE will always be ultimately responsible for his/her successful training, the Mentor has a moral and professional responsibility to coach and guide successfully the GE through the Training Period.

The goal of the training programme is to allow graduate engineers to develop their competency until they are able to demonstrate the outcomes at the required level on a sustained basis and to take responsibility for the work performed.

In agreeing to assist a graduate engineer, the mentor must commit to the following duties:

a) The mentor must participate in the planning and give advice on the suitability of the programme of work and experience for the graduate engineer's development. Training tasks or phases must be planned to ensure that the graduate engineer develops the competency required for registration in the applicable category.
b) The mentor must ensure that the graduate engineer is increasingly exposed to demands relating to problem-solving, management, impact assessment and mitigation in addition to consideration of ethical issues, judgement and responsibility.
c) The mentor must ensure that the graduate engineer completes the agreed training.
d) On completion of each agreed task or phase, the mentor must receive a report from the graduate engineer and review the outcomes achieved in view of the objectives
e) The mentor must assist the graduate engineer in deciding when he/she is ready to apply for qualifying examinations and thereafter, assist with the actual application.

Mentors thus appointed should be sensitive to any limitations that the employer may set in any given situation. A Mentor must, therefore, maintain several relationships and manage these to ensure that the often conflicting needs of each are reasonably satisfied.

It is preferred that a mentor manages **a maximum of five graduate engineers** at a given time.

4.2.3 Graduate Engineer

Graduate Engineers should appreciate that it is their responsibility to ensure that the training received will culminate in the competency defined in the standards. The ERC prefers that graduates follow a training programme that has been registered by the ERC and as required, has at least one registered mentor. Should graduate engineers experience difficulties with their training, they should attempt to resolve them through the normal channels, for example, with the mentors responsible for their guidance. Otherwise, matters not resolved by the Mentor should be reported to the secretariat for assistance and guidance.

4.3 Planning and Managing the Training Process

This section aims to assist the graduate engineer and the mentor in the planning of the programme and the progression of the graduate engineer.

4.3.1 Types of programme

These guidelines apply to graduates proceeding via training programmes. It is recognised that an individual graduate may experience a combination of training in and outside a training programme and that training may be carried out with different employers. The result must always be the same – being able to perform at the required level of competency and to be responsible for the work that is performed and required for registration in the chosen class. Three measures are recommended:

a) The graduate engineer's record-keeping must be consistent across the various periods and modes of training.
b) If possible, the graduate engineer should retain the same mentor if the employer or mode of training changes.
c) In the final analysis, the graduate engineer must take ownership of the training.

4.3.2 Duration of the programme

The purpose of a training programme is to allow a person who has fulfilled the educational outcomes to attain the competency required for professional registration. It is unlikely that this competence can be developed and demonstrated at the required level in less than two years. During this time, the graduate engineer's competency will develop and must be demonstrated at the required level over a certain period. Mentors, graduate engineers and employers must plan for a period of not less than two years for the training.

4.3.3 Planning principles

Three principles must be followed by mentors when planning a graduate engineer's training:

a) The planning, execution and monitoring must focus on the competencies to be developed.

b) A variety of work activities is necessary for the proper development of a graduate engineer. The object of having a variety of work is to broaden the experience of the graduate engineer and to ensure that all aspects of competency are developed and ultimately assessed. Variety may be obtained in different ways, both singly and in combination:
   i. The engineering activities of an individual are located at various stages in the life cycle of an engineering activity, that is, conception, planning, design, construction/implementation, operation and withdrawal.
   ii. Associated with this lifecycle are specific functions that include commissioning, testing, improving and trouble-shooting. The graduate engineer should experience several stages in the life cycle of a project or projects.

iii. Variety may also involve different aspects of a discipline (or cross-disciplinary fields). The discipline-specific training guidelines/requirements give indications of the acceptable variety of experience in different disciplines and may elaborate on training aspects appropriate to the discipline.

c) Increasing responsibility and accountability within the organisation must be imposed and accepted by the graduate engineer until he/she is capable of accepting professional responsibility in making and executing engineering decisions at the full professional level. The degree of responsibility defined in Table 1 should be used for quantifying the level of responsibility and accountability.

4.3.4 Progression of training programme

During development from the graduate engineer level to meeting the competency requirements for professional registration, the graduate engineer progresses through levels of work capability until the required level for registration is attained. A useful scale indicating progression throughout the candidacy programme is presented in Table 1. The table shows the nature of the graduate engineer's work at each degree of responsibility, ranging from being orientated in the engineering environment at degree A: Being Exposed, to working at the degree of responsibility required for professional registration, namely E: Performing.

The responsibility that should be placed on the graduate engineer at each stage is in terms of the graduate engineer's own responsibility and the extent of mentoring support. More detailed information on progression – how this general definition can be linked to disciplinary contexts – is included in the discipline-specific training guidelines.

The main learning process is through working with competent engineering personnel. The trainee is under the direct or indirect supervision of an engineering professional – the mentor - who guides the trainee's professional development. The graduate engineer is involved in engineering work of adequate variety and increasing demand and responsibility. Initially, the graduate engineer assists with engineering work, carrying out defined tasks under close supervision. The graduate engineer progresses by contributing individually and as a team member to the work. By the end of the training period, the graduate engineer must perform individually and as a team member at the level of problem-solving and engineering activity that is required for professional registration and must exhibit a degree of responsibility. This level of work provides evidence of competency against the standards. Over time, the emphasis on training, that is, learning through the inputs of others, gives way to experience, learning by performing engineering work and reflecting on observations and achievements.

Table 1: Progression throughout the training period

Degree of Responsibility	Nature of work: the candidate	Responsibility of Candidate to Supervisor	Extent of Supervisor/ Mentor Support
A: Being Exposed	Undergoes induction, observes processes, work of competent practitioner	No responsibility	Mentor explains challenges and forms of solution
B: Assisting	Performs specific processes under close supervision	Limited responsibility for work output	Supervisor/Mentor coaches, offers feedback
C: Participating	Performs specific processes as directed with limited supervision	Full responsibility for supervised work	Supervisor progressively reduces support but monitors outputs
D: Contributing	Performs specific work with detailed approval of work outputs	Full responsibility to supervisor for immediate quality of work	Candidate articulates own reasoning and compares it with that of supervisor
E: Performing	Works in team without supervision, recommends work outputs, responsible but not accountable	Level of responsibility to supervisor is appropriate to a registered person; supervisor is accountable for candidate's decisions	Candidate takes on problem-solving without support, or at most, with limited guidance

4.3.5 Review of mentorship programme

The training programme of a fresh graduate engineer is expected to run for not less than 2 years and preferable to a maximum of 5 years from the time the graduate registered with ERC as Graduate Engineer. The Mentor shall monitor the progress made by the graduate engineer against the scheduled milestone dates. It is the responsibility of the graduate engineer to ensure that the set milestones are achieved as scheduled. The mentor provides an oversight role and guides the graduate engineer towards achieving the required competence for professional registration.

In a situation where the mentor observes that the graduate engineer's training programme is not progressing due to the graduate engineer's lack of effort, interest, or other, or where the graduate engineer fails to demonstrate attainment of competence after a period of 5 years, the mentor shall inform the Registrar in writing. It shall be the responsibility of the Council to decide the course of action to be taken on the graduate engineer's training programme after hearing out his/her side of the story and in reference to the existing Regulations. Actions by the Council may range from issuing of a written warning to the graduate engineer and a new training program to termination of the training program all together.

The graduate engineer may lodge concerns with the MEI Registrar where failure to make progress is attributed to a greater extent to the failure of the mentor to execute his responsibilities. The registrar shall institute an investigation into the concerns and provide written direction within 3 months from the date of receipt of the communique.

Where the mentor consistently demonstrates lack of interest, unconcern behaviour, perpetual delays in executing his/her duties, the Registrar shall inform the Council about the particular mentor. The Council has the mandate to take decision on the underperforming mentor. Such decisions may range from being deregistered from the list of mentors to being deregistered from the list of Professional Engineers.

4.3.6 Documenting training and experience outline

Phase-by-phase planning and the review of the graduate engineer's training must be supported by documentation for the immediate purpose of managing training and for compiling evidence when the graduate engineer has to apply for qualifying examinations.

Training and experience are generally arranged as separate activities, tasks or phases. Each phase of an activity is designed to develop specific aspects of competency (outcomes) at an agreed level of problem-solving and engineering activity with the appropriate degree of responsibility. Such a unit typically ranges from several weeks to several months in duration. For each task or phase, the graduate engineer together with the mentor should use a suitable format for recording the planned outcomes, the level to be achieved and the results of the previous phase.

The graduate engineer should use the "Training Records for Registered Graduate Engineers" booklet provided in drafting portfolio of evidence. This booklet allows particular aspects of competency to be identified as being amenable to development in the task or phase. In addition, the level at which competency is to be demonstrated and the nature of the graduate engineer's responsibility are identified.

When the task or phase is complete, the graduate engineer and the mentor must assess the level of competence that was learnt and displayed. Level descriptors for problem-solving and the demands of engineering work should be consulted to determine progress to the exit level. Such achievement (or shortfall) may influence the planning for subsequent tasks or phases. This assessment is also recorded on the form. The assessment at the end of one phase should form an input to the planning of the subsequent and future phases.

The process continues until the graduate engineer is working at the level required for professional registration (Degree of Responsibility E: Performing) against individual outcomes and as a whole. When the graduate engineer applies for qualifying examinations, each task or phase must be summarised in the Training Records for Registered Graduate Engineers booklet. Each activity is described in company and generic terms. Company terms include the names of specific plants, processes and sites while generic descriptions include terms such as design, trouble shooting, construction and commissioning. The Training Records for Registered Graduate Engineers booklet is required in the application for qualifying examinations. It is, therefore, advisable for the graduate engineer to complete and update the booklet all the time.

As the programme progresses, the graduate engineer's competency must develop towards that required professional registration level. Mentors should be alert to the graduate engineers' attainment of this level of competence.

4.4 Demonstrating Sound Judgement, Responsibility and Ethics

The competency standards require not only the demonstration of technical and engineering management proficiency but also the ability to exercise sound judgement, to take responsibility and to act ethically in making engineering decisions. The requirement is that the graduate engineer must demonstrate that he/she is able to exercise sound judgement, take responsibility and act ethically throughout the engineering work performed. This requires careful management by the mentor.

The following section outlines the legal constraints on graduate engineers exercising sound judgement, taking responsibility and acting ethically while performing engineering work.

4.4.1 Legal constraints

Under the MEI Act, a graduate engineer is not allowed to take responsibility for the work. Various sections of the Act require registration for particular aspects of work. Section 25(1) prescribes registration as the

prerequisite to practising of engineering in any class. Section 31(4) requires that a person should be registered as a graduate engineer to work under the supervision and control of a registered mentor.

Registration as a graduate engineer provides a mechanism for persons to perform work under supervision – work that would otherwise be reserved for registered professional engineers – and thereby demonstrate competency for registration. Such work must be performed under the supervision and control of a registered professional engineer who must take responsibility for the work.

4.4.2 Managing conflict

The following aspects need to be considered:

- Taking due care to ensure that the objectives of engineering work are achieved in an ethical manner
- Addressing impacts of engineering work and risks
- Being accountable for the work, in particular that due care was taken to deal with risks

Mentors must implement strategies to ensure that the graduate engineer can demonstrate the ability to exercise due care without having to make decisions that require accountability. Taking due care requires the graduate engineer to exercise the following defined competencies: problem-solving, management, impact identification and mitigation, ethical behaviour together with acting responsibly and applying sound judgement. Working within the limits of these competencies is a clear requirement. In such a mode of working, the graduate engineer would be required by the mentor to express judgements and propose decisions and recommendations; these may be at the level that a registered person would normally perform. The graduate engineer does not carry any legal accountability but within the employer or organisation, he/she is accountable. The mentor must check the judgements, decisions and recommendations as he/she bears ultimate responsibility for the work.

4.4.3 Diversity of engineering

With the requirements for the graduate engineer to exercise sound judgement, take responsibility and act ethically, it is important to recognise that the scope of engineering that must be adhered to is too wide for definitive training guides.

Engineering education, training and work is generally partitioned according to disciplines/sub-disciplines and industry sectors such as consulting, contracting, construction, manufacture, mining, process industries, services, utilities and infrastructure. Within a sector or discipline, an engineering practitioner may be concerned with systems, processes, components or materials. The competency standards identify the generic outcomes for competent practitioners irrespective of the discipline or industry sector, for example, identify and analyse problems and synthesise solutions. These represent the fundamental transferable competencies. Rather than formulating complex requirements for all functions, the system relies on engineering peers for training and assessment. Peers are persons who are engineering practitioners in the same discipline and are registered in the class to which the graduate engineer aspires.

4.4.4 Goals of training and experience

Section 3.1 of this guideline summarises and groups the competencies that must be demonstrated in the assessment process when the graduate engineer applies for qualifying examinations. Engineering professional competence is more than satisfying a linear list of outcomes.

The core activity of engineering is problem-solving, that is, bringing about change from an initial state to a final state and overcoming the barriers involved to achieve a result that is useful to people, enterprises and society. Knowledge that is based on Engineering Science is applied while accounting for the impacts of engineering activities, the legal and regulatory factors, and ethics.

Responsible, judgement-based decision-making and management of the process is essential to achieve the engineering goals. Competent engineering practitioners underpin their activities by continuous learning, both formally and informally.

Graduate engineers and mentors must focus at all times on the goal of training, namely the development of competence as specified by the outcomes in the standard and the required level of performance; these must be viewed in an integrated way. The required level of performance consists of two principal parts, the level of engineering activities within which the graduate engineer operates and the level of problem-solving.

4.4.5 Relating the competency standards to specific work

The generic competencies of problem-solving, management, impact analysis and taking responsibility manifest themselves in several forms of activity such as design, investigation, trouble-shooting, improvement, research and development. Each of these activities can be expanded, for example, design includes the preparation of a brief. At a company-specific level, these activities are performed in relation to specific plant, operations and business functions.

Graduate engineers should consider both the specific requirements of the task or phase of work and the generic competencies required for the work.

The graduate engineer should identify and analyse problems, synthesise solutions and use their knowledge in the process. The graduate engineer must examine and deal with the legal and regulatory factors and the environmental, social and cultural impacts of the engineering activities.

4.4.6 Evidence-based system

Evidence of competent performance has two essential components: firstly, the capability to perform a number of defined actions must be demonstrated, and secondly, the performance must be at or exceed a specified level of demand. The defined actions are the outcomes and typifying actions that reflect acceptable performance according to the assessment criteria. The level is defined by a specification of the demands of the engineering activities and the nature of problem-solving. In a professional field, evidence of competent performance is obtained from the competent performance of substantial engineering tasks by the person being assessed. Typical tasks provide evidence of several outcomes, and the assessment must be holistic.

The 11 outcomes defined for each category of engineering professional represent different aspects of holistic performance and professional attributes. While competence is specified by 11 outcomes to be demonstrated at a particular level, the applicant for professional registration must demonstrate integrated performance against outcomes. This reflects the reality that an engineering task or function is unlikely to require only one outcome, for example, problem analysis seldom stands alone; it will require the use of knowledge, the analysis of impacts and must lead seamlessly into the solution phase.

Engineering problem-solving comprising analysis and synthesis is central to all engineering activities, including design, investigation and management. Problem-solving is supported by a number of capabilities corresponding to outcomes 3 to 10. Outcome 11, which is CPD, is better expressed as the maintenance and extension of competency and provides a platform for the performance of outcomes 1 to 10.

Different engineering functions and assignments will have different mixes of demand. As part of the application for professional registration, the applicant is expected to provide evidence of working at the required level of problem-solving in engineering activities at the specified level of demand.