ENSURING THE EXPERTISE TO GROW SOUTH AFRICA

Discipline-specific Training Guide for Candidate Engineering Technologist in Agricultural Engineering

R-05-AGR-PT

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DEFINITIONS

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

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

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

**Integrated performance** means that an overall satisfactory outcome of an activity requires several outcomes to be satisfactorily attained, for example, a design requires analysis, synthesis, analysis of impacts, checking of regulatory conformance and judgement in decisions.

**Level descriptor** means a measure of performance demands at which outcomes must be demonstrated.

**Management of engineering works or activities** means coordinated activities required to:

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

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

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

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

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

**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.
Outcome at the professional level means a statement of the performance that a person must demonstrate to be judged competent.

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

Range statement means the required extent of or limitations on expected performance stated in terms of situations and circumstances in which outcomes are to be demonstrated.

Specified category means a category of registration for persons who must be licensed through the Engineering Profession Act or a combination of the Engineering Profession Act and external legislation as having specific engineering competencies at NQF Level 5 related to an identified need to protect the public safety, health and interest or the environment, in relation to an engineering activity.
BACKGROUND

The illustration below defines the documents that comprise the Engineering Council of South Africa (ECSA) system for registration in professional categories. The illustration also locates the current document.

Figure 1: Documents defining the ECSA registration system

1. PURPOSE OF THIS DOCUMENT

All persons applying for registration as a Professional Engineering Technologist should demonstrate the competencies specified in document R-02-PT at the prescribed level, irrespective of the trainee’s discipline, through work performed by the applicant at the prescribed level of responsibility.
This document supplements the generic Training and Mentoring Guide R-04-P and the Guide to the Competency Standards for Professional Engineering Technologists Document R-08-PT. In document R-04-P, attention is drawn to the following sections:

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

The second document, R-08-PT, provides both a high-level and an outcome-by-outcome understanding of the competency standards as an essential basis for this discipline specific guide.

This guide, as well as R-04-P and R-08-PT, is subordinate to the Policy on Registration, document R-01-POL, the Competency Standard (R-02-PT) and the application process definition (R-03-PRO).

2. AUDIENCE
This guide is directed to candidates, their supervisors and mentors in the discipline of Agricultural Engineering. It is intended to support a programme of training and experience incorporating good practice elements.

This guide applies to persons who have:
- completed the education requirements by obtaining an accredited BTech (Agricultural Engineering), a BEngTech type qualification or a Sydney-Accord recognised qualification or through evaluation/assessment;
- registered as Candidate Agricultural Engineering Technologists;
- embarked on a process of acceptable training, preferably under a registered Commitment and Undertaking (C&U), with a mentor guiding the professional development process at each stage;
followed a programme of training and experience incorporating the good practice elements described in this guide.

3. PERSONS NOT REGISTERED AS CANDIDATES OR NOT BEING TRAINED UNDER COMMITMENT AND UNDERTAKING

All applicants for registration must present the same evidence of competence and be assessed against the same standards, irrespective of the development path followed. Application for registration as a Professional Engineering Technologist is permitted without being registered as a Candidate Engineering Technologist or without training under a C&U.

Mentorship and adequate supervision are, however, key factors in effective development to the level required for registration. A C&U indicates that the company is committed to mentorship and supervision.

If the trainee’s employer has no C&U, the trainee should establish the level of mentorship and supervision the employer is able to provide. In the absence of an internal mentor, the services of an external mentor should be secured. The Voluntary Association (VA) for the discipline should be consulted for assistance in locating an external mentor. A mentor should be in place at all stages of the development process.

This guide is written for the recent graduate who is training and gaining experience toward registration. Mature applicants for registration may apply the guide retrospectively to identify possible gaps in their development.

Applicants who have not enjoyed mentorship are advised to request an experienced mentor (internal or external) to act as an application advisor while they prepare their application for registration.

The guide may be applied in the case of a person moving into a candidacy programme at a later stage that is at a level below that required for registration.
4. AGRICULTURAL ENGINEERING

Agricultural engineering technologist

The expertise of an agricultural engineering technologist, who has unique skills to connect the living world of plants, soil, water and animals with the technology of engineering (i.e. systems, structures and machines), is required to ensure sustainable environments with adequate water supplies, energy and food production, and processing systems. Agricultural engineering technologists thus operate at the interfaces between engineering science and practice, agricultural production and processing, and rural environmental management. The implication is that agricultural engineering technologists must be aware of the important factors in agricultural production and processing, and environmental sustainability. This is ensured by including mandatory introductory agricultural courses in agricultural engineering technologists' tertiary education. Candidates who have degrees in engineering specialties other than agricultural have to demonstrate that they have acquired this knowledge through practical experience in at least one of the many diverse areas of sustainable agricultural production and processing for them to register as agricultural engineering technologists.

An agricultural engineering technologist plans, performs and supervises broadly defined engineering work related to the development and/or improvement of infrastructure, machinery and processes for agricultural production, the post-harvest handling and processing of agricultural produce, and similar engineering processes in associated environmental and biological contexts. This may include the use and development of agricultural land, environment, infrastructure (buildings, roads, river crossings, dams, irrigations systems, electrification, etc.), machines, equipment and processes.

Due to the multi-disciplinary nature of Agricultural Engineering, practicing agricultural engineering technologists generally concentrate in one or more of the following areas:

- Energy Engineering
- Renewable Energy Engineering
- Agricultural Product Processing Engineering
Agricultural Structures and Facilities Engineering
Agricultural Waste Handling and Management
Aquaculture Engineering
Mechanisation Engineering
Irrigation Engineering
Hydrology and Agricultural Water Use
Management Natural Resources Engineering
Food Engineering
Environmental Engineering
Rural Infrastructure Engineering

Potential fields of work for agricultural engineering technologists include the following:

- Advising on and/or conducting broadly defined research and development of techniques applicable in agriculture (i.e. soil and water, power and machinery, processing and handling of agricultural/biological products, structures and environment, energy – particularly renewable energy, and biological systems).
- The design, management and/or advising on broadly defined technology for food, fibre and energy production systems including the design, sizing, selection and management of agricultural machinery, implements and equipment for field operations (e.g. for soil preparation, planting, harvesting, storage and transport of produce), testing and evaluation of new agricultural machinery and equipment, the use of precision agriculture technologies (e.g. GIS, GPS) to ensure optimal and sustainable agricultural production systems which take due consideration of the environment, and the design and operation of transportation systems to move produce from fields to storage facilities, factories and consumers.
- The design and management of broadly defined irrigation systems to irrigate plants efficiently to obtain optimal yield per unit of water applied; and the design and installation of drainage systems for land conservation and optimal crop production.
- The design and management of broadly defined agricultural and rural water resource systems by the design of dams, canals, boreholes, extraction works and pipe networks for water supply to agriculture and humans, the assessment of the availability of water resources to meet demands for water in a highly variable climate in South Africa.
management of water resources by reconciling demands for water with the available supplies, the design of broadly defined soil and water conservation systems to control run-off and thus minimise erosion and maximise agricultural production, and by sustaining the environment by minimising any negative impacts of agricultural practices.

- The design and operation of broadly defined agricultural structures and infrastructure (e.g. farm buildings, farm roads, minor river crossings and bridges, animal handling facilities, agricultural waste handling and management facilities, spray races and dips).

- The design and management of broadly defined food processing and storage systems to add value to raw agricultural products using technology to preserve and process food and animal feed, and ensure products are safe for human consumption (e.g. structures, cold stores, pack houses, factories and plants for agricultural produce value addition, cooling, heating, dehydration and pasteurisation facilities, grain handling, storage and silo facilities, fish processing plants, abattoirs, distribution and marketing structures).

- The design and management of broadly defined intensive animal and plant production structures and control systems which may have controlled environments for optimal plant (e.g. greenhouses) and animal (e.g. housing structures, broiler units, dairy plants, milking parlours) production.

- The use of renewable sources of energy by the design and development of broadly defined technology to grow and utilise sustainable sources of energy (e.g. hydro, biofuels, solar, wind) and the processing of agricultural products and biomass into bioenergy (e.g. anaerobic digesters).

- Design, management and advising on broadly defined power and energy systems for agricultural production, including design, sizing, selection and management of agricultural machinery and equipment (e.g. engines, motors, pumps, fans, pipes), testing and evaluation of new agricultural machinery and equipment.

- Determining and specifying construction methods, materials and quality standards, and directing construction work.

- Establishing control systems to ensure efficient functioning of infrastructure as well as safety and environmental protection.

- Organising and directing operation, maintenance and repair of agricultural production machinery, equipment, structures and facilities.
• Analysing the stability of structures, machinery and implements and testing the behaviour and durability of materials used in their construction.
• Testing and calibrating new and existing agricultural equipment, training users and developing their operational and testing manuals.

5. NATURE AND ORGANISATION OF THE INDUSTRY

5.1 Diverse fields of specialisation

Agricultural Engineering encompasses a diverse range of fields and it would be unrealistic to expect a Candidate Engineering Technologist to achieve exposure to the full range of fields during the training period or even throughout his career. However, it is important that the Candidate Engineering Technologist:
• is exposed to and demonstrates a good understanding of the context within which he/she is applying his/her knowledge, skills and engineering judgement;
• gains experience across the full spectrum of tasks in the typical lifecycle of engineering projects; and
• is familiar with the statutory requirements related to his/her field of operation.

5.2 Contextual knowledge

By nature, work in the Agricultural sector is closely integrated with biological systems and the natural environment. Furthermore, it requires the engineering technologist to have a thorough understanding of the range of people and circumstances that an agricultural engineering solution would need to be suited to, which may vary from ultramodern agro-industrial factories and complex multi-faceted commercial farming enterprises, through to robust pro-poor rural food security systems within complex multi-user social structures.

The strong contextual nature of Agricultural Engineering solutions holds specific implications for the training of Candidate Engineering Technologists. It is strongly recommended that Candidate Engineering Technologists also acquire first-hand exposure to and experience of the non-engineering context (farms, rural communities, agri-businesses) within which Agricultural
Engineering solutions need to be relevant. Adequate first-hand exposure will enable the Candidate Engineering Technologist to:

- understand that he/she is working with the uncertainties of economy, climate, different social contexts and farming environments;
- understand, respect and be able to collaborate with related disciplines in a broadly defined environment, including specialists in crops, soils, food science, health, chemical suppliers, environmental aspects; and
- appreciate the economic realities in agriculture, including low margins in agriculture, resource-poor communities, and socio-economic impacts of and on engineering interventions.

### 5.3 Tasks/Functions in the engineering project lifecycle

Candidate Engineering Technologists should ensure that the work they engage in during the training period is relevant to their progression towards registration, and gradually increase their degree of responsibility. They should further ensure that they gain experience in all the typical tasks in the lifecycle of agricultural engineering projects, specifically including practical site work and engineering design. The tasks in the engineering project lifecycle are further elaborated in “Appendix A: Training Elements”, namely:

(a) Solving broadly defined engineering problems, using engineering and contextual knowledge;
(b) Planning/implementing/operating engineering projects/systems/products/processes;
(c) Mitigating risk and impact; and
(d) Managing engineering activities.

The Candidate Engineering Technologist can develop further insight into the typical stages in the implementation of engineering projects by studying the Guideline Scope of Services and Tariff of Fees for Persons Registered in terms of the Engineering Profession Act, 46 of 2000 (see Engineering Council of South Africa Board Notice No. 208 of 2011 in the Government Gazette No. 34875 of 20 December 2011).
The six stages for implementing normal services in an engineering project are:

- **Stage 1** – Inception (including assessment of needs and resources).
- **Stage 2** – Concept and Viability (often called Preliminary Design).
- **Stage 3** – Design Development (also termed Detail Design).
- **Stage 4** – Documentation and Procurement (developing of tender documentation including drawings, specifications, quantities and tenders/contracts, and procurement, including tendering process).
- **Stage 5** – Contract Administration and Inspection (requiring adequate first-hand practical experience of the Candidate Engineering Technologist in site work, such as fabrication, construction, manufacturing, installation, construction administration and inspection).
- **Stage 6** – Close-Out (project close-out and handover, including commissioning, operating documentation and as-built plans).

For continuing projects in an operational environment, the Agricultural Engineering Technologist may be responsible for project management such as ongoing operation and maintenance, asset management and renewal, and optimisation, including:

- post-implementation/operation/management
- shut-down, preventative maintenance
- ongoing optimisation
- repair, refurbishment, upgrading
- decommissioning, safe disposal / re-use / recycling.

Both practical experience in site work (Stage 5) and engineering design (Stages 2 and 3) are essential in training an Agricultural Engineering Technologist. It should be noted that design is not restricted to physical infrastructure and artefacts, but may also produce new processes or operating systems.

### 5.4 Industry-related statutory requirements, risk and impact mitigation

The close association of Agricultural Engineering with biological and environmental systems requires specific attention to risk and impact mitigation, and requires the Candidate
Engineering Technologist to develop a good working knowledge of specific laws and regulations, including but not limited to the following:

(a) Atmospheric Pollution Prevention Act, 45 of 1965  
(b) Conservation of Agricultural Resources Act, 43 of 1983 (CARA)  
(c) Land Reform legislature  
(d) Land Use Planning Ordinance, 15 of 1985 (LUPO)  
(e) National Environmental Management Act, 107 of 1998  
(f) National Environmental Management Biodiversity Act, 10 of 2004  
(g) National Environmental Management Waste Act, 59 of 2008  
(h) National Water Act, 36 of 1998  

6. DEVELOPING COMPETENCY: DOCUMENT R-08-PT

Candidate Engineering Technologists can demonstrate competency in their field by compiling a portfolio of evidence, structured according to the eleven outcomes mentioned in R-02-PT and further described in R-08-PT. The eleven outcomes are organised in five groups (Groups A–E), which are explained below.

Group A: Knowledge-based problem solving (this should be a strong focus)
The Candidate Engineering Technologist may develop and demonstrate competency in Outcomes 1, 2 and 3 by providing evidence of broadly defined problem identification and analysis which successfully interpreted a diversity of factors in farming, rural development or agro-industrial contexts affecting possible engineering solutions; examples of identification, evaluation, selection, design and implementation of suitable engineering solutions (which may include infrastructure and/or processes); and application of engineering and non-engineering knowledge and insight to achieve workable solutions.

Group B: Management and communication
Evidence of the Candidate Engineering Technologist’s competency in Outcomes 4 and 5, management and communication in Agricultural Engineering, can include examples of planning, organising and human resource management, funds, machinery, methods and
materials in site work and agricultural engineering office contexts. This may also include professional and effective communication with farmers, rural communities, contractors, persons engaged in agro-industry, relevant government departments, clients and peers.

**Group C: Identifying and mitigating the impacts of engineering activity**

Examples demonstrating competency in Outcome 6, identifying and mitigating the impacts of agricultural engineering activity may include the responsible development, utilisation and protection of natural resources related to agriculture, including water, soil, biodiversity and air quality. It may further include mitigation of non-regulated impacts, such as disturbances to social and economic stability through ill-considered engineering developments, particularly in remote rural areas.

Evidence of competency in Outcome 7 may include examples of protection of human, animal and plant health, in farming and agro-industrial contexts, in addition to compliance with relevant regulatory requirements in the design of engineering solutions.

**Group D: Judgement and responsibility**

For Outcomes 8, 9 and 10, Candidate Engineering Technologists should demonstrate that they are willing and able to take responsibility for broadly defined decisions, and are competent in judgement and responsible conduct in accordance with the ECSA Code of Conduct.

**Group E: Independent learning**

For Outcome 11, the Candidate Engineering Technologist should develop the ability and habit for independent and lifelong learning, and provide evidence of relevant Continuous Professional Development (CPD) activities completed during the training period, using the CPD guidance documentation available on the ECSA website.
6.1 Recommended practical and formal learning activities

The following practical and formal learning activities/objectives are recommended for inclusion in the training period for a Candidate Engineering Technologist in Agricultural Engineering:

- Practical exposure to non-engineering skills and underlying background experience in farming, rural development and/or agro-industry contexts. If possible, it is strongly advised that Candidate Agricultural Engineering Technologists work in a farming or agro-industrial environment for a period of three months to a year upon graduation.
- Getting into the habit of participating in CPD functions related to the discipline.
- Networking and getting to know peers and related disciplines.
- Developing targeted soft skills to act effectively with respect to social realities and management contexts.
- Attendance of industry-related conferences/presentations/seminars/workshops.
- IT/software applications relevant to the discipline.
- Project planning and management.
- Engineering management.
- Entrepreneurship and business management.

7. PROGRAMME STRUCTURE AND SEQUENCING

7.1 Level of responsibility

The Candidate Engineering Technologist, with his/her supervisor and mentor, should ensure that his/her work is structured and sequenced to enable systematic progression towards registration. Progress can be planned and measured using the scales for degree of responsibility, engineering activity and engineering problem-solving as described in R-04-P: Training and Mentoring Guide and R-08-PT: Guide to the Competency Standard.

Progression throughout the candidacy period in R-04-P refers to the gradual increase in the degree of responsibility that a Candidate Engineering Technologist is expected to acquire.
and exhibit during his/her engineering training. Specific examples and outcomes appropriate to training in Agricultural Engineering are given below:

<table>
<thead>
<tr>
<th>Degree of Responsibility</th>
<th>Nature of work. The candidate should:</th>
<th>(Activities/duties to be undertaken during training in Agricultural Engineering)</th>
</tr>
</thead>
</table>
| A: Being Exposed         | …undergoes induction, observes processes and work of competent practitioners | While working under close supervision of a competent/professional and senior colleagues in the firm/organisation, the trainee should:  
  • be directed to read the various acts and regulations that affect the work of a professional engineering technologist  
  • be exposed to the firm or organisation’s work environment, including the organisational structure  
  • read materials about the firm/organisation  
  • be exposed to field work and engineering office work environment and culture  
  • attend and participate in meetings, including office, field/site meetings, seminars, workshops, etc.  
  • be sensitised to the importance of CPD and relevant vocational society meetings  
  • be exposed and/or trained in the use of both general and specialised computer software packages used by the firm/organisation in its delivery of day-to-day work  
  • be part of a team comprising competent engineering personnel and Candidate Engineering Technologists working on engineering projects in a sub-discipline of agricultural engineering  
  • if possible, be attached/exposed to different broadly defined projects in the known sub-disciplines of agricultural engineering  
  • be personally committed to his/her development and training by gaining experience in the full range of engineering activities available in the firm/organisation. |
| B: Assisting             | … performs specific processes under close supervision | While working under close supervision of a professional person, the trainee should:  
  • be engaged in broadly defined engineering tasks under close supervision of a competent person  
  • develop and display an appreciation of the numerous resources at the disposal of an agricultural engineering technologist  
  • be engaged in conducting broadly defined special studies or
# Discipline-specific Training Guideline for Candidate Engineering Technologists in Agricultural Engineering

**Compiler:** MB Mtshali  
**Approving Officer:** EL Nxumalo

<table>
<thead>
<tr>
<th>Degree of Responsibility</th>
<th>Nature of work. The candidate...</th>
<th>(Activities/duties to be undertaken during training in Agricultural Engineering)</th>
</tr>
</thead>
</table>
| **C: Participating**     | ... performs specific processes as directed with limited supervision | research to solve customer service problems  
- assist in the selection of consultants and contractors  
- assist in the preparation of and issuance of proposals to consultants and contractors  
- be assigned broadly defined responsibilities of assisting/supervising new staff at the degree of responsibility “A – Being Exposed” level and other lower level technical staff  
- assist in the review of bid proposals and assist in making recommendations and forward his/her report to the supervising professional  
- be personally committed to his/her development and training by gaining experience of the whole range of broadly defined engineering activities available in the firm/organisation. |

<table>
<thead>
<tr>
<th><strong>D: Contributing</strong></th>
<th>... performs specific work with detailed approval of work outputs</th>
<th>While working under minimum supervision, the trainee applies broadly defined engineering technology and knowledge of biological sciences to agricultural problems concerned with power and machinery, electrification, structures, soil and water conservation, and processing of agricultural products, to:</th>
</tr>
</thead>
</table>

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QM-TEM-001 Rev 0 – ECSA Policy/Procedure
### Discipline-specific Training Guideline for Candidate Engineering Technologists in Agricultural Engineering

<table>
<thead>
<tr>
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<th>Nature of work. The candidate…</th>
<th>(Activities/duties to be undertaken during training in Agricultural Engineering)</th>
</tr>
</thead>
</table>
| E: Performing            | … works in team without supervision, recommends work outputs, responsible but not accountable | • develop broadly defined criteria for design, manufacture, or construction of equipment, structures, and facilities  
• design and use sensing, measuring, and recording devices and instrumentation to study such problems as effects of temperature, humidity, and light on plants or animals, or relative effectiveness of different methods of applying insecticides  
• design and direct manufacture of broadly defined equipment for land tillage and fertilisation, plant and animal disease and insect control, and for harvesting or transport of commodities  
• design and supervise erection of broadly defined structures for crop storage, animal shelter and human dwelling, including light, heat, air-conditioning, water supply and waste disposal  
• plan and direct construction of broadly defined irrigation, drainage, and flood-control systems for soil and water conservation  
• design and supervise installation of broadly defined equipment and instruments used to evaluate and process farm products, and automate agricultural operations groups and related farm cooperatives  
• remain committed to CPD.  
It should be noted that the trainee need not contribute/work in all the areas because the firm/organisation may not be involved in engineering work covering all the agricultural engineering sub-disciplines.  

While working under no supervision, the trainee applies broadly defined engineering technology and knowledge of biological sciences to agricultural problems concerned with power and machinery, electrification, structures, soil and water conservation, and processing of agricultural products, in order to:  
• develop broadly defined criteria for design, manufacture, or construction of equipment, structures, and facilities  
• develop and implement broadly defined production, processing and management systems  
• design and use sensing, measuring and recording devices and instrumentation to study such problems as effects of… |
7.2 Best practice

Recognition of prior engineering training outside the realm of ECSA training requirements guide should be used to determine the level of responsibility a late entrant or one who has changed employment should join the candidacy programme. The onus is placed on the trainee applicant to provide verifiable evidence that previous engineering work they were
involved in indeed meets the requirements of the degree of responsibilities contained in this DSTG.

7.3 Generalists

Persons whose formative development has not followed a conventional path, for example academics, researchers, and specialists are enabled to register. The overriding consideration is that to be registered, a person, irrespective of the route followed, must provide evidence of competence against the standard. The onus is on applicants to provide verifiable evidence that the degree of responsibility and competence required in this DSTG have been met.

7.4 Moving into candidacy programmes

This guide assumes that the candidate enters a programme after graduation and continues with the programme until ready to submit an application for registration. It also assumes that the candidate is supervised and mentored by persons who meet the requirements in document R-04-P. In the case of a person changing from one candidacy programme to another or moving into a candidacy programme from a less structured environment, it is essential that the following steps be completed:

- The candidate must complete the Training and Experience Summary (TES) and Training and Experience Reports (TER) for the previous programme or unstructured experience. In the latter case it is important to reconstruct the experience as accurately as possible. The TERs must be signed off.
- On entering the new programme, the mentor and supervisor should review the candidate’s development in the light of the past experience and opportunities as well as requirements of the new programme, and plan at least the next phase of the candidate’s programme.
## REVISION HISTORY

<table>
<thead>
<tr>
<th>Revision Number</th>
<th>Revision Date</th>
<th>Revision Details</th>
<th>Approved By</th>
</tr>
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<tbody>
<tr>
<td>Rev 1</td>
<td>17 July 2014</td>
<td></td>
<td>Central Registration Committee</td>
</tr>
<tr>
<td>Rev 2</td>
<td>23 May 2019</td>
<td>Routine Review Approval</td>
<td>RPSC</td>
</tr>
</tbody>
</table>

The Discipline-Specific Training Guide for:

**Candidate Engineering Technologist in Agricultural Engineering**

Revision 2 dated 25 July 2019 and consisting 21 pages reviewed for adequacy by the Business Unit Manager and is approved by the Executive: Research, Policy and Standards (RPS).

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Business Unit Manager

Date

Executive: RPS

Date

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

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QM-TEM-001 Rev 0 – ECSA Policy/Procedure
APPENDIX A: TRAINING ELEMENTS

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

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

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

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

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### Competency Standards for Registration as a Professional Engineering Technologist

<table>
<thead>
<tr>
<th>Explanation and Responsibility Level</th>
</tr>
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<tbody>
<tr>
<td><strong>1. Purpose</strong></td>
</tr>
<tr>
<td>This standard defines the competence required for registration as a Professional Engineering Technologist. Definitions of terms having particular meaning within this standard is given in Appendix B.</td>
</tr>
<tr>
<td><strong>2. Demonstration of competence</strong></td>
</tr>
<tr>
<td>Competence must be demonstrated within broadly defined engineering activities, defined below, by integrated performance of the outcomes defined in section 3 at the level defined for each outcome. Required contexts and functions may be specified in the applicable Discipline Specific Guidelines.</td>
</tr>
</tbody>
</table>

#### Level Describer: Broadly defined engineering activities (BDEA) have several of the following characteristics:

- **a) Scope** of practice area is linked to technologies used and changes by adoption of new technology into current practice
- **b) Practice area** is located within a wider, complex context, requires teamwork, has interfaces with other parties and disciplines
- **c) Involve the use of a variety resources**, including people, money, equipment, materials, technologies
- **d) Require resolution of occasional problems arising from interactions between wide-ranging or conflicting technical, engineering or other issues**
- **e) Are constrained by available technology, time, finance, infrastructure, resources, facilities, standards and codes, applicable laws**
- **f) Have significant risks and consequences** in the practice area and in related areas.

#### Activities include but are not limited to: design; planning; investigation and problem resolution; improvement of materials, components, systems or processes; manufacture or construction; engineering operations; maintenance; project management; research; development

#### Level Describer: BDEA in the various disciplines are characterised by several or all of:

- **a) Scope** of practice area does not cover the entire field of the discipline (exposure limited to the sub-discipline and specific workplace). Some technologies used are well established and adoption of new technologies needs investigation and evaluation;
- **b) Practice area** varies substantially with unlimited location possibilities and an additional responsibility to identify the need for advice on complex activities and problems. Broadly defined activities in the sub-discipline needs interfacing with professional engineers, professional technicians, artisans, architects, financial staff, etc. as part of the team;
- **c) The bulk of the work** involves familiar, defined range of resources, including people, money, equipment, materials, but new technologies are investigated and implemented;
- **d) Most of the impacts** in the sub discipline are on wider issues, but some arise from conflicting technical and engineering issues that have to be addressed by the application of broadly defined non-standard engineering principles;
- **e) The work packages and associated parameters are constrained by operational context** with variations limited to different locations only. (Cannot be covered by standards and codes).
- **f) Even locally important minor risks can have far reaching consequences.**

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

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QM-TEM-001 Rev 0 – ECSA Policy/Procedure
3. Outcomes to be satisfied: | Explanation and Responsibility Level
--- | ---
**Group A: Engineering Problem Solving.**

<table>
<thead>
<tr>
<th>Outcome 1:</th>
<th>Responsibility level E</th>
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<tbody>
<tr>
<td>Define, investigate and analyse <strong>broadly defined</strong> engineering problems</td>
<td>Analysis of an engineering problem means the &quot;separation into parts possibly with comment and judgement&quot;. <strong>Broadly</strong> means &quot;not minute or detailed&quot; and &quot;not kept within narrow limits&quot;.</td>
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</tbody>
</table>

**Broadly defined engineering problems** have the following characteristics:
- require coherent and detailed engineering knowledge, underpinning the technology area; and one or more of:
  - (a) are ill-posed, under- or over-specified, require identification and interpretation into the technology area
  - (b) encompass systems within complex engineering systems; belong to families of problems which are solved in well-accepted but innovative ways; and one or more of:
    - (c) can be solved by structured analysis techniques;
    - (d) may be partially outside standards and codes; must provide justification to operate outside
    - (e) require information from practice area and sources interfacing with practice area that is complex and incomplete
    - (f) involves a variety of issues which may impose conflicting constraints: technical, engineering and interested or affected parties; and one or both of:
      - (g) requires judgement in decision-making in practice area, considering interfaces to other areas
      - (h) have significant consequences which are important in practice area but may extend more widely.

(a) coherent and detailed engineering knowledge for Engineering Technologists means the problem encountered cannot be solved without the combination of all the relevant detail including engineering principles applicable to the situation
(b) the nature of the problem is not immediately obvious, and further investigation to identify and interpret the real nature of the problem is necessary
(c) the problem is not easily recognised as part of the larger engineering task, project or operation and may be obscured by the complexity of the larger system
(d) recognised that the problem can be classified as a falling within a typical solution requiring innovative adaptation to meet the specific situation
(e) solving the problem needs a step-by-step approach adhering to proven logic
(f) the standards, codes and documented procedures must be analysed to determine to what extent they are applicable to solve the problem and justification must be given to operate outside these
(g) the responsibility lies with the Engineering Technologist to verify that some information received as part of the problem encountered may remain incomplete and solutions to problems may need justified assumptions
(h) the problem handled by an Engineering Technologist may be solved by alternatives that are unaffordable, detrimental to the environment, socially unacceptable, not maintainable, not sustainable, etc; the Technologist will have to justify his/her recommendation
(i) practical solutions to problems include knowledge and judgement of the roles displayed by the multi-disciplinary team and impact of own work in the interactive environment
(j) Engineering Technologists must realise that their actions might seem to be of local importance only but may develop into significant consequences extending beyond their own ability and practice area.
### Outcomes to be satisfied:

**Assessment criteria:** A structured analysis of broadly defined problems typified by the following performances is expected:

1. **Performed or contributed in defining engineering problems leading to an agreed definition of the problems to be solved.**
2. **Performed or contributed in investigating engineering problems including collecting, organising and evaluating information.**
3. **Performed or contributed in analysis of engineering problems using conceptualisation, justified assumptions, limitations and evaluation of results.**

**Range statement:** The problem may be a design requirement, an applied Research and Development requirement or a problematic situation in an existing component, system or process. The problem is one amenable to solution by technologies known to the candidate. This outcome is concerned with the understanding of a problem: Outcome 2 is concerned with the solution.

**Outcome 2:** Design or develop solutions to broadly defined engineering problems

**Assessment criteria:** This outcome is normally demonstrated after a problem analysis as defined in outcome 1. Working systematically to synthesise a solution to a broadly defined problem, typified by the following performances is expected:

1. **Designed or developed solutions to broadly defined engineering problems.**
2. **Systematically synthesised solutions and alternative solutions or approaches to the problem by analysing designs against requirements, including costs and impacts on outside parameters. (requirements).**
3. **Drawing up of detailed specification requirements and design documentation for implementation to the satisfaction of the client.**

**Explanation and Responsibility Level**

- **To perform an engineering task an engineering technologist will typically receive an instruction from a senior person (customer) to do a specific task, and must:**
  1. **Make very sure that the instruction is complete, clear and within his/her capability and that the person who issued the instruction agrees with his/her interpretation.**
  2. **The engineering problem and related information must be segregated from the bulk of the information, investigated and evaluated.**
  3. **Ensure that the instruction and information to do the work is fully understood and complete, including engineering theory needed to understand the task and acceptance criteria, and to carry out and/or check calculations. If needed supplementary information must be gathered, studied and understood. Concepts and assumptions must be justified by engineering theory and calculations, if applicable.**

**Please refer to section 4 of the specific DSTG.**

- **After the task received is fully understood and interpreted, a solution to the problem posed can be developed (designed).**
  1. **The development (design) of more than one way to solve an engineering task or problem should always be done, including the costing and impact assessment for each alternative. All the alternatives must meet the requirements set out by the instruction received, and the theoretical calculations to support each alternative must be done and submitted as an attachment.**
  2. **The Engineering Technologist will in some cases not be able to support proposals with the complete theoretical calculation to substantiate every aspect and must in these cases refer his / her alternatives to an engineer for scrutiny and support.**
  3. **The best complete and final solution selected must be followed up with a detailed technical specification, supporting drawings, bill of quantities, etc. for the execution of work to meet customer requirements.**

**Responsibility level C and D**

- **Design means “drawing or outline from which something can be made”.**
- **Develop means “come or bring into a state in which it is active or visible”.**
### 3. Outcomes to be satisfied:

<table>
<thead>
<tr>
<th>Range Statement</th>
<th>Explanation and Responsibility Level</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Outcome 3:</strong></td>
<td>Comprehend and apply the knowledge embodied in widely accepted and applied engineering procedures, processes, systems or methodologies and those specific to the jurisdiction in which he/she practices.</td>
</tr>
<tr>
<td><strong>Responsibility level</strong></td>
<td>E</td>
</tr>
<tr>
<td><strong>Comprehend means</strong></td>
<td>“to understand fully”. The jurisdiction in which an Engineering Technologist practices is given in section 4 of the specific Discipline Specific Training Guideline.</td>
</tr>
</tbody>
</table>

**Assessment criteria:** This outcome is normally demonstrated in the course of design, investigation or operations.

3.1 Applied engineering principles, practices, technologies, including the application of BTech theory in the practice area.

3.2 Indicated working knowledge of areas of practice that interact with practice area to underpin teamwork.

3.3 Applied related knowledge of finance, statutory, safety and management.

**Range Statement:** Applicable knowledge includes:

(a) Technological knowledge that is well-established and applicable to the practice area irrespective of location, supplemented by locally relevant knowledge, for example, established properties of local materials. Emerging technologies are adopted from formulations of others.

(b) A working knowledge of interacting disciplines (engineering and other) to underpin teamwork.

(c) Jurisdictional knowledge includes legal and regulatory requirements as well as locally relevant codes of practice. As required for practice area, a selection of: law of contract, health and safety, environmental, intellectual property, contract administration, quality management, risk management, maintenance management, regulation, project and construction management.

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<tr>
<td><strong>Range Statement:</strong></td>
<td>(a) The specific location of a task to be executed is the most important determining factor in the layout design and utilisation of equipment. A combination of educational knowledge and practical experience must be used to substantiate decisions taken including a comprehensive study of systems, materials, components and projected customer requirements and expectations. New ideas, materials, components and systems must be investigated, evaluated and applied accompanied by complex theoretical motivation.</td>
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<td></td>
<td>(b) In spite of having a working knowledge of interacting disciplines, Engineering Technologists take responsibility for the multidisciplinary team of specialists like civil engineers on structures and roads, mechanical engineers on fire protection equipment, architects on buildings, electrical engineers on communication equipment, etc.</td>
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<td></td>
<td>(c) Jurisdictional in this instance means “having the authority”, and Engineering Technologists must be aware of and decide on the relevant requirements applicable to each specific project that he/she is responsible for. They are usually appointed as the “responsible person” for specific projects in terms of the OHS Act.</td>
</tr>
</tbody>
</table>
Group B: Managing Engineering Activities.

<table>
<thead>
<tr>
<th>Outcome 4: Manage part or all of one or more broadly defined engineering activities.</th>
<th>Explanation and Responsibility Level</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Assessment criteria:</strong> The candidate is expected to display personal and work process management abilities:</td>
<td>In engineering operations Engineering Technologists will typically be given the responsibility to carry out projects.</td>
</tr>
<tr>
<td>4.1 Managed self, people, work priorities, processes and resources in broadly defined engineering work.</td>
<td>4.1 Resources are usually subdivided based on availability and controlled by a work breakdown structure and scheduling to meet deadlines. Quality, safety and environment management are important aspects.</td>
</tr>
<tr>
<td>4.2 Role in planning, organising, leading and controlling broadly defined engineering activities evident.</td>
<td>4.2 The basic elements of managements must be applied to broadly defined engineering work.</td>
</tr>
<tr>
<td>4.3 Knowledge of conditions and operation of contractors and the ability to establish and maintain professional and business relationships evident.</td>
<td>4.3 Depending on the project, Engineering Technologists can be the team leader, a team member, or can supervise appointed contractors. To achieve this, maintenance of relationships is important and must be demonstrated.</td>
</tr>
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<table>
<thead>
<tr>
<th>Outcome 5: Communicate clearly with others in the course of his/her broadly defined engineering activities.</th>
<th>Responsibility level C</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Assessment criteria:</strong> Demonstrates effective communication by:</td>
<td>5.1 Refer to Range Statement for Outcome 4 and 5 below.</td>
</tr>
<tr>
<td>5.1 Ability to write clear, concise, effective technical, legal and editorially correct reports shown.</td>
<td>5.2 Refer to Range Statement for Outcome 4 and 5 below.</td>
</tr>
<tr>
<td>5.2 Ability to issue clear instructions to stakeholders using appropriate language and communication skills evident.</td>
<td>5.3 Presentation of point of view mostly occurs in meetings and discussions with immediate supervisor.</td>
</tr>
<tr>
<td>5.3 Oral presentations made using structure, style, language, visual aids and supporting documents appropriate to the audience and purpose.</td>
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</table>

**Range Statement for Outcomes 4 and 5:** Management and communication in *well-defined engineering* involves:

- Planning broadly defined activities
- Organising broadly defined activities
- Leading broadly defined activities
- Controlling broadly defined activities.

(a) Planning means “the arrangement for doing or using something, considered in advance”
(b) Organising means “put into working order, arrange in a system, make preparations for”
(c) Leading means to “guide the actions and opinions of, influence, persuade”
(d) Controlling means the “means of regulating, restraining, keeping in order, check”

Engineering Technologists write specifications for the purchase of materials and/or work to be done, recommendations on tenders received, place orders and variation orders, write work instructions, report on work done, draw, correct and revise drawings, compile test reports, use operation and maintenance manuals to write work procedures, write inspection and audit reports, write commissioning reports, prepare and present motivations for new projects, compile budget reports, report on studies done and calculations carried out, report on customer requirements, report on safety incidents and risk analysis, report on equipment failure, report on proposed system improvement and new techniques, report on cost control, etc.
### Group C: Impacts of Engineering Activity.

<table>
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<tr>
<th>Outcome 6:</th>
<th>Explanation and Responsibility Level</th>
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</table>
| Recognise the foreseeable social, cultural and environmental effects of broadly defined engineering activities generally | **Responsibility level B**<br>Social means “people living in communities; of relations between persons and communities”. Cultural means “all the arts, beliefs, social institutions, etc. characteristic of a community”. Environmental means “surroundings, circumstances, influences”.

**Assessment criteria:** This outcome is normally displayed in the course of analysis and solution of problems. The candidate typically shows:<br>6.1 Ability to identify interested and affected parties and their expectations in regard to interactions between technical, social, cultural and environmental considerations shown.<br>6.2 Measures taken to mitigate the negative effects of engineering activities evident.

<table>
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<tr>
<th>Outcome 7:</th>
<th>Responsibility level E</th>
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| Meet all legal and regulatory requirements and protect the health and safety of persons in the course of his/her broadly defined engineering activities. | **Responsibility level E**

**Assessment criteria:**<br>7.1 Identified applicable legal and regulatory requirements including health and safety requirements for the engineering activity.<br>7.2 Circumstances stated where applicant assisted in or demonstrated awareness of the selection of safe and sustainable materials, components and systems and have identified risk and applied risk management strategies.<br>7.1 The OHS Act is supplemented by a variety of parliamentary acts, regulations, local authority by-laws, standards and codes of practice. Places of work might have standard procedures, instructions, drawings and operation and maintenance manuals available. These documents, depending on the situation (emergency, breakdown, etc.) are consulted before work is commenced and during the activity.<br>7.2 It is essential to attend a Risk Management (Assessment) course, and to investigate and study the materials, components and systems used in the workplace. The Engineering Technologist seeks advice from knowledgeable and experienced specialists if the slightest doubt exist that safety and sustainability cannot be guaranteed.
Range Statement for Outcomes 6 and 7: Impacts and regulatory requirements include:
(a) Requirements include both explicit regulated factors and those that arise in the course of particular work
(b) Impacts considered extend over the lifecycle of the project and include the consequences of the technologies applied
(c) Effects to be considered include direct and indirect, immediate and long-term related to the technology used
(d) Safe and sustainable materials, components and systems
(e) Regulatory requirements are explicit for the context in general.

The impacts will vary substantially with the location of the task, e.g. the impact of laying a cable or pipe in the main street of town will be entirely different to construction in a rural area. The methods, techniques or procedures will differ accordingly and may be complex. It is identified and studied by the Engineering Technologist before starting the work.

The Safety Officer and/or the Responsible Person appointed in accordance with the OHS Act usually confirms or checks that the instructions are in line with regulations. The Engineering Technologist is responsible to see that this is done, and if not, establish which regulations apply, and ensure that they are adhered to. Usually the people working on site are strictly controlled w.r.t. health and safety, but the Engineering Technologist checks that this is done, but may authorise unavoidable deviation after setting conditions for such deviations. Projects are mostly carried out where contact with the public cannot be avoided, and safety measures like barricading and warning signs must be used and maintained.

Effects associated with risk management are mostly well known if not obvious, and methods used to address, clearly defined. Risks are mostly associated with elevated structures, subsidence of soil, electrocution of human beings and moving parts on machinery. The Engineering Technologist needs to identify, analyse and manage any long-term risks and develop strategies to solve these by using alternative technologies.

The safe and sustainable materials, components and systems must be selected and prescribed by the Engineering Technologists or other professional specialists must be consulted. It is the responsibility of the Engineering Technologist to use his/her knowledge and experience to confirm that prescriptions by others are correct and safe.

Application of regulations associated with the particular aspects of the project must be carefully identified and controlled by the Engineering Technologist.

Group D: Exercise judgment, take responsibility, and act ethically.

Outcome 8: Conduct engineering activities ethically.

Responsibility level E
Ethically means “science of morals; moral soundness”.
Moral means “moral habits; standards of behaviour; principles of right and wrong”.

Assessment Criteria: Sensitivity to ethical issues and the adoption of a systematic approach to resolving these issues is expected, typified by:
8.1 Conversance and operation in compliance with ECSA’s Rules of Conduct for registered persons confirmed
8.2 How ethical problems and affected parties were identified, and the best solution to resolve the problem selected.

Systematic means ‘methodical; based on a system’.

8.1 ECSA’s Code of Conduct, as per ECSA’s website, is known and adhered to.
8.2 Ethical problems that can occur include tender fraud, payment bribery, alcohol abuse, sexual harassment, absenceism, favouritism, defamation, fraudulent overtime claims, fraudulent expenses claimed, fraudulent time recording and incorrect claims.

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<tr>
<th>Outcome 9:</th>
<th>Responsibility level E</th>
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</thead>
<tbody>
<tr>
<td>Exercise sound judgement in the course of broadly defined engineering activities</td>
<td>Judgement means “good sense: ability to judge”.</td>
</tr>
</tbody>
</table>

**Assessment criteria:** Judgement is displayed by the following performance

9.1 Judgement exercised in arriving at a conclusion within the application of technologies and their interrelationship to other disciplines and technologies.
9.2 Factors taken into consideration given, bearing in mind, risk, consequences in technology application and affected parties.

9.1 The extent of a project given to a junior Engineering Technologist is characterised by the several broadly defined and a few well-defined factors and their resulting interdependence. He/she will seek advice if educational and/or experiential limitations are exceeded.
9.2 Taking risky decisions will lead to equipment failure, excessive installation and maintenance cost, damage to persons and property, etc. Evaluation includes engineering calculations to substantiate decisions taken and assumptions made.

**Range Statement for Outcomes 8 and 9: Judgement in decision making involves:**

(a) taking several risk factors into account;
(b) significant consequences in technology application and related contexts; or
(c) ranges of interested and affected parties with widely varying needs.

In Engineering, about 5% of engineering activities can be classified as broadly defined where the Engineering Technologist uses standard procedures, codes of practice, specifications, etc, but develops variations and completely unique standards when needed. Judgement must be displayed to identify any activity falling inside the broadly defined range, as defined above:

(a) Getting the work done in spite of numerous risk factors needs good judgement and substantiated decision-making.
(b) Consequences are part of the project e.g. extra cost due to unforeseen conditions, incompetent contractors, long-term environmental damage, etc.
(c) Interested and affected parties with defined needs that may be in conflict, e.g. need for a service irrespective of environmental damage, local traditions and preferences, etc. needs sound management and judgement.

<table>
<thead>
<tr>
<th>Outcome 10:</th>
<th>Responsibility level E</th>
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<tbody>
<tr>
<td>Be responsible for making decisions on part or all of all of one or more broadly defined engineering activities</td>
<td>Responsible means “legally or morally liable for carrying out a duty; for the care of something or somebody in a position where one may be blamed for loss, failure, etc.”.</td>
</tr>
</tbody>
</table>
### Assessment criteria: Responsibility is displayed by the following performance:

10.1 Engineering, social, environment and sustainable development taken into consideration in discharging responsibilities for significant parts of one or more activities.

10.2 Advice sought from a responsible authority on matters outside your area of competence.

10.3 Academic knowledge of at least BTech level combined with past experience used in formulating decisions.  

10.1 All interrelated factors taken considered are indicative of professional responsibility accepted working on broadly defined activities.

10.2 The Engineering Technologist does not operate on tasks at a higher level than broadly defined and consults professionals at engineer level if elements of the project to be done are beyond his/her education and experience, e.g. power system stability.

10.3 This is in the first instance continuous self-evaluation to ascertain that the task given is done correctly, on time and within budget. Continuous feedback to the originator of the task instruction and corrective action, if necessary, forms an important element. The calculations, for example fault levels, load calculations, losses, etc. are done to ensure that the correct material and components are utilised.

### Range Statement: Responsibility must be discharged for significant parts of one or more broadly defined engineering activity.

The responsibility is mostly allocated within a team environment with an increasing designation as experience is gathered.

### Note 1: Demonstrating responsibility would be under supervision of a competent engineering practitioner but is expected to perform as if he/she is in a responsible position.

### Group E: Initial Professional Development (IPD)

<table>
<thead>
<tr>
<th>Outcome 11:</th>
<th>Explanation and Responsibility Level</th>
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</thead>
<tbody>
<tr>
<td>Undertake independent learning activities sufficient to maintain and extend his or her competence.</td>
<td>Responsibility level D</td>
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</table>

### Assessment criteria: Self-development managed typically:

11.1 Strategy independently adopted to enhance professional development evident.

11.2 Awareness of philosophy of employer in regard to professional development evident.

11.1 If possible, a specific field of the sub-discipline is chosen, available developmental alternatives established, a programme drawn up (in consultation with employer if costs are involved), and options open to expand knowledge into additional fields investigated.

11.2 Record keeping must not be left to the employer or anybody else. The trainee must manage his/her own training independently, taking initiative and being in charge of experiential development towards Professional Engineering Technologist level.
**Range Statement:** Professional development involves:

(a) Planning own professional development strategy.
(b) Selecting appropriate professional development activities.
(c) Recording professional development strategy and activities, while displaying independent learning ability.

(a) In most places of work training is seldom organised by some training department. It is up to the Engineering Technologist to manage his/her own experiential development. Engineering Technologists frequently end up in a ‘dead-end street’ being left behind doing repetitive work. If self-development is not driven by him/herself, success is unlikely.
(b) Preference must be given to engineering development rather than developing soft skills.
(c) Developing a learning culture in the workplace environment of the Engineering Technologist is vital to his/her success. Information is readily available, and most senior personnel in the workplace are willing to mentor, if approached.