ROAD TO REGISTRATION

FOR SUPERVISORS AND MENTORS ON THE ISDG PROGRAMME

municipal academy

This training guide seeks to explain the processes recommended by the Engineering Council of South Africa (ECSA) for registering engineering professionals.

ECSA is responsible for:

- Setting educational and professional development standards with a view to registering persons who apply for registration as professionals
- Registering qualified graduates as candidates in each of the professional categories
- Registering Commitment and Undertaking (C&U) agreements with employers including mentor C&Us
- Monitoring the effectiveness of C&Us by assessing the quality of applications
- Ensuring effective, safe and sustainable engineering activity by promoting best practice and intervening when malpractices or cases of improper conduct are reported

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1. Philosophy of The Candidacy Phase

The purpose of the candidate phase is to expose and train candidates in a variety of engineering activities and develop them in problem solving, judgement and responsible engineering decision making, in accordance with the ECSA outcomes.

An **Engineering Problem** is a problematic situation or need that is amenable to analysis and solution using engineering sciences and methods. **Problem solving** is the act of defining a problem; determining the cause of the problem; identifying, and considering alternative solutions; deciding on the optimal solution and implementing that solution. This must form the basis, and guide mentors and supervisors, in the planning of training, assessment and the development of the candidate at the desired level of responsibility and complexity, throughout the candidate phase.

However, it is essential that the candidate manages his/her development and is constantly aware of the progress he/she has made, and the development levels attained. The mentor and the supervisor must constantly reinforce the candidates' training plan, assess, discuss and ensure the candidate is aware of his/her responsibility in terms of professional development and shortcomings.

The requirements, processes and methodologies are detailed in the manual.

WHO ARE WE TALKING ABOUT?

The Engineering Profession Act, 2000 (No. 46 of 2000) came into effect in 2001. This Act calls for engineering practitioners to be assessed and registered by the Engineering Council of South Africa (ECSA) before they may take responsibility for engineering projects. The Act empowers ECSA to register people in certain prescribed categories of registration as follows:

PROFESSIONALS

- Professional Engineer (Pr Eng)
- Professional Engineering Technologist (Pr Tech Eng)
- Professional Certificated Engineer (Pr Cert Eng)
- Professional Engineering Technician (Pr Techni Eng)

CANDIDATES

- Candidate Engineer
- Candidate Engineering Technologist
- Candidate Certificated Engineer
- Candidate Engineering Technician

Candidate registration provides for registration of those who meet the academic requirements for registration in the professional categories and who are undergoing workplace training towards professional registration. This phase is known as the **Candidacy Phase**.

ROUTES TO REGISTRATION

Figure 1 shows the stages of development for engineering professionals from schooling through to continuing professional development (CPD) as registered professionals. It is expected that applicants will have matriculated and completed one or more of the qualifications shown in Figure 1.

It is, however, possible to register through the **Alternative Route** by having the candidate's education assessed through the completion of additional forms, or by being assessed by the **Educational Evaluation** process outlined in ECSA policy document E-17-P *'Criteria and Processes for Recognition of Educational Qualifications for Professional Categories'.*

The conventional qualifications shown in Figure 1 are assumed to be in place and the approach to registration outlined in the balance of the manual will be on this basis.

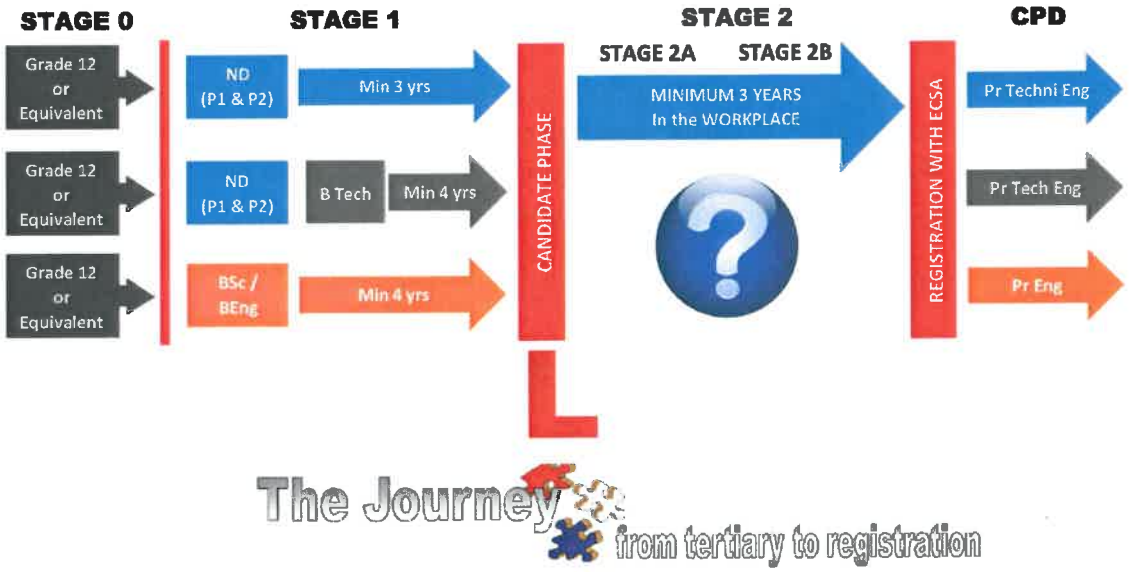

FIGURE 1: ROAD TO REGISTRATION

Stage 1: Tertiary education

During Stage 1, students undergo formal tertiary engineering education. Stage 1 can be achieved by obtaining:

- A three-year National Diploma in engineering, i.e. a minimum of two years at a university of technology and one year of experiential learning, OR
- A three-year National Diploma in engineering plus a BTech qualification at a university of technology, OR
- A four- or five-year (extended) degree referred to as a BSc(Eng), BEng or BIng

Stage 2: Candidacy phase

During this phase graduates will gain experience in the workplace and take added responsibility to develop towards professional registration. They will work under supervision and be given guidance by the mentor.

THE REGISTRATION PROCESS

Since the inception of registration for engineering professionals, it has been recognised that candidates should gain experience in:

- Problem investigation
- Problem solution
- Execution or implementation
- Taking responsibility

In line with international practices, the current registration system follows an outcomes-based approach. This means that how competence is developed is not prescribed, but rather the achievement of outcomes is the controlling factor in the candidate's training. The outcomes are referred to as ECSA outcomes.

What outcomes will be measured?

The ECSA outcomes which candidates must demonstrate are listed in Table 1. The outcomes apply to all categories of registration. The degree of complexity of tasks performed is the differentiator.

TABLE 1: THE OUTCOMES TO BE ACHIEVED

No	Outcome
1	**Define**, investigate and analyse engineering problems
2	**Design** or develop solutions to engineering problems
3	**Comprehend and apply** advanced **knowledge**, principles and specialist knowledge, jurisdictional and local knowledge
4	**Manage** part or all of one or more engineering activities
5	**Communicate** clearly with others in the course of his or her engineering activities
6	**Recognise** and address the reasonably foreseeable social, cultural and environmental effects of engineering activities
7	Meet all **legal** and regulatory requirements and protect the health and safety of persons in the course of his or her engineering activities
8	Conduct engineering activities **ethically**
9	Exercise sound **judgement** in the course of engineering activities
10	Be **responsible** for making decisions on part or all of engineering activities
11	Undertake **professional development** activities sufficient to maintain and extend his or her competence

Figure 2 demonstrates that problem investigation and solution are at the heart of being an engineering professional, but this must be supported by the other outcomes to ensure acceptable and sustainable solutions are developed.

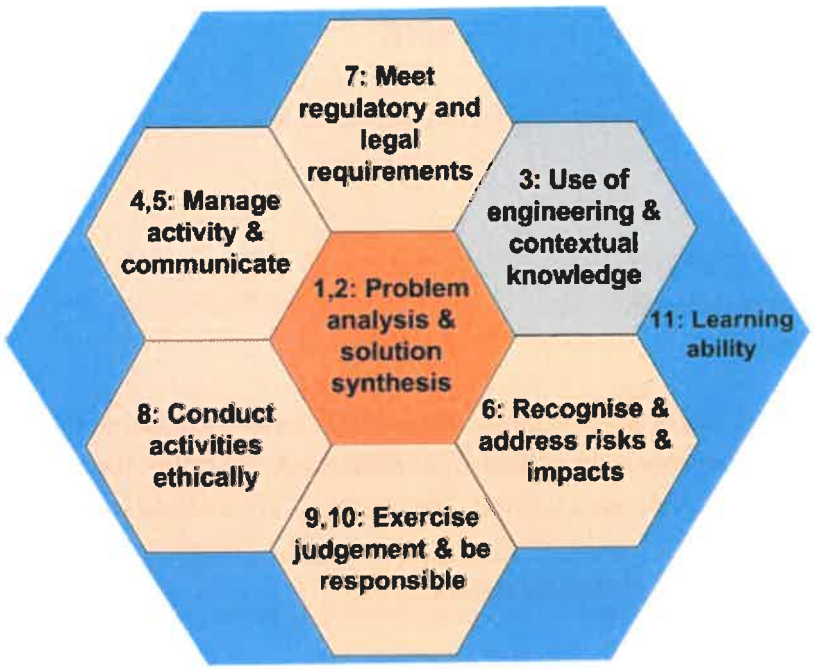

FIGURE 2: THE OUTCOMES

Essentially the outcomes fall into groups as follows:

- **Group A – Engineering problem solving**
  1. Define, investigate, analyse engineering problems
  2. Design or develop solutions to engineering problems
  3. Comprehend and apply advanced knowledge
- **Group B – Managing engineering activities**
  4. Manage part or all of an engineering activity
  5. Communicate clearly
- **Group C – Managing impacts of engineering activities**
  6. Recognise and address social, cultural, environmental effects
  7. Meet legal and regulatory requirements
- **Group D – Exercising judgement, taking responsibility & acting ethically**
  8. Behave ethically
  9. Exercise sound judgement
  10. Take responsibility for decision making
- **Group E – Continuing professional development (CPD)**
  11. Undertake professional development

Levels of responsibility

ECSA calls for candidates to take on increasing levels of responsibility as shown in Table 2. (Refer to the ECSA training guideline, R-04-P)

TABLE 2: INCREASING RESPONSIBLITY

Level	Nature of work: The candidate	Responsibility of candidate	Level of supervisor/mentor Support
A. Being exposed	... undergoes induction, observes processes, work of competent practitioners	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 quality of work	Candidate articulates own reasoning and compares it with those 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	Candidate takes on problem solving without support, at most limited guidance

At the performing level, the candidate is responsible, but not yet accountable, for his or her work. Sign-off continues to be done by the supervisor until such time as the candidate is professionally registered.

Complexity

The candidate must perform engineering activities at the level of complexity for his/her category of registration. The candidates' progress and development will be measured at the desired level of responsibility in accordance with the following categories of complexity, for each category of registration:

- Professional Engineers **(Pr Eng)** - handle ***complex*** engineering activities
- Professional Engineering Technologists **(Pr Tech Eng)** - handle ***broadly defined*** engineering activities
- Professional Engineering Technicians **(Pr Techni Eng)** - handle ***well-defined*** engineering activities

The complexity of engineering work is detailed in Section 3.

2. The Training Team

Role-players in the training team are shown in Figure 3. Each has a specific role to play.

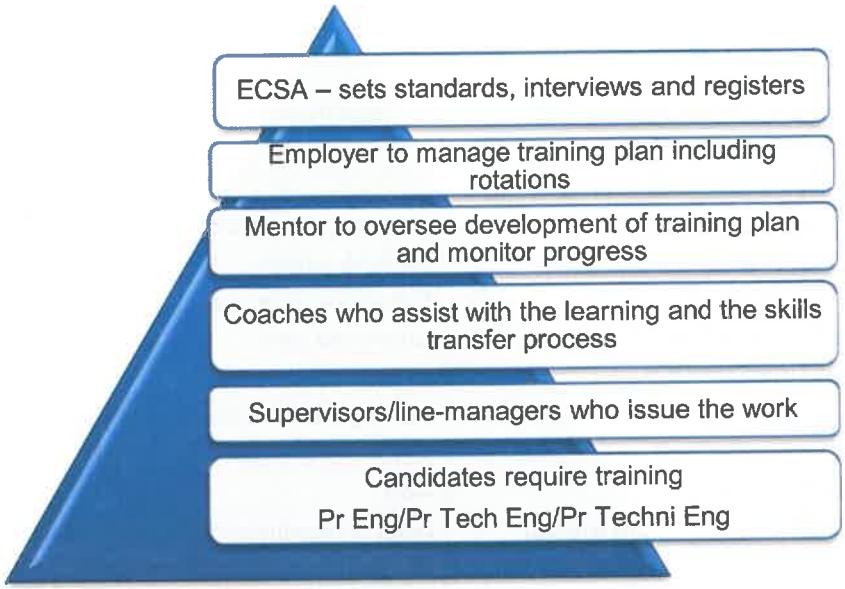

FIGURE 3: THE TRAINING TEAM

CANDIDATES

To ensure a successful development process candidates should:

- Undergo training with employers who have registered a C&U with ECSA
- Discuss and agree on a Training Plan with their mentors. These plans should take cognisance of the suggestions in the Discipline-Specific Training Guidelines (DSTG). The Training Plan should also include provision for Initial Professional Development (IPD), to satisfy the requirements of outcome 11
- Hold regular discussions with their mentors to review progress and to amend Training Plans as necessary. It is the candidate's responsibility to initiate these discussions, but the mentor should follow up with the candidate if planned dates are not met
- Complete a Training and Experience Report (TER) on completion of each period of experience and get these reports signed off by the appropriate supervisor. (Training records form an essential part of monitoring progress to ensure that the required competencies and standards are met)
- Keep records of all IPD activities undertaken and complete IPD forms
- When ready for registration complete the Engineering Report
- Be registerable once all the objectives have been achieved and certified, and can apply for registration as a professional
- On completion of their training, request the mentor to complete a confidential Referee Report

The onus rests on candidates to ensure that the training they received will meet all the requirements set out in ECSA policy documents.

SUPERVISORS

Candidates will be allocated to a supervisor who will be responsible for day-to-day work allocation. The supervisor will need to provide candidates with a variety of technical tasks over the training period, which will require **problem investigation, problem solving, execution or implementation and an increasing level of acceptance of responsibility for these tasks.**

The supervisor must:

- Where possible, assist the candidate to acquire a mentor (internal or external)
- Be aware of the candidate's Training Plan developed with the help of the mentor
- Assist the candidate in developing the required levels of competency throughout the training period
- Liaise with the mentor as required

COACHES

Skills coaching refers to supervising the accomplishment of a task and fostering learning by asking questions, explaining decisions and soliciting suggestions.

The supervisor will play a critical role in providing clear and lucid directions with respect to work issued and will provide input, feedback, guidance and support. In so doing, the supervisor will double as a coach and, where necessary as a teacher and tutor.

Since supervisors are generally very busy, experienced professionals, the time they can devote to assisting the candidate will be limited. If the candidate is stuck, they should also consider asking other senior personnel in the office, their peers who may already have been coached in that area, or technical staff, including those who have served the organisation for a long time, such as draughtsmen and detailers who have accumulated a wealth of knowledge over the years.

If there is more than one candidate in the discipline, they should consider forming a 'buddy' group and schedule time for debating and brainstorming topics that will help stimulate their development. In this way, candidates will be able to coach each other.

MENTORS

Mentors will play the most significant role in ensuring that each candidate who applies for professional registration has developed and acquired the necessary range and level of competencies. In preparing a candidate for registration, the ultimate result of the mentor's actions is ensuring the ongoing sustainability of the profession and consequently the image and status that engineering professionals will have in the future. mentors may be either internal or external mentors. The mentor's role is to:

- Participate in drawing up and developing the Training Plan together with the candidate and supervisor, as well as certifying that its end results have been met. The mentor should maintain a 'bird's-eye view' of the Training Plan
- Hold discussions with the candidate at least every three or four months, review progress and amend the Training Plan as necessary
- Assess the candidate's progress in accordance with the guidelines set out in the Policy Statements
- Ensure that competent, suitably qualified and experienced supervisors or coaches, preferably registered with ECSA, are made responsible for control of the detailed training and day-to-day work of each candidate
- Ensure that the Training Plan includes IPD activities and convey to candidates the importance of CPD
- Prepare the candidate for registration, which will include:
  - Requiring that each candidate prepares an Engineering Report to demonstrate how the outcomes have been achieved
  - The candidate requesting the mentor to complete a confidential Referee Report

MENTORING VS COACHING

From the above discussion, it is evident that there is a major difference between the role of the mentor and that of the supervisor who would generally act as a coach. The mentor essentially plans and oversees the candidate's career development to professional registration, while various supervisors will be responsible for assigning and overseeing their day-to-day tasks.

The role of the mentor and supervisor is well captured in the following definitions:

- **Mentor** - a senior experienced professional who will assist and measure the candidate's progress towards registration for the duration of the development process
- **Supervisor** - an experienced professional who, for the time that the candidate works for him or her, will allocate work, provide technical guidance and support, and will take ultimate responsibility for the candidate's work

Table 3 offers more insight on the difference between mentoring and coaching.

TABLE 3: MENTORING VS COACHING

MENTORING	COACHING
Long term	Short term
Focus on career and personal development	Focus on development in the workplace
Development as a whole	Development of competence
Develop capabilities	Develop skills
Leadership focus	Management focus
Focus on progress	Focus on task
Intuitive feedback	Explicit feedback

3. The Development Process

The development process is shown in Figure 4. Graduates are expected to register as candidates with ECSA, gain experience in the workplace and plan and follow an initial professional development (IPD) programme on their journey to registration. Throughout the process, they are expected to record progress and participate in regular reviews to ensure that their training objectives are being met. The elements making up the development process are discussed in more detail below.

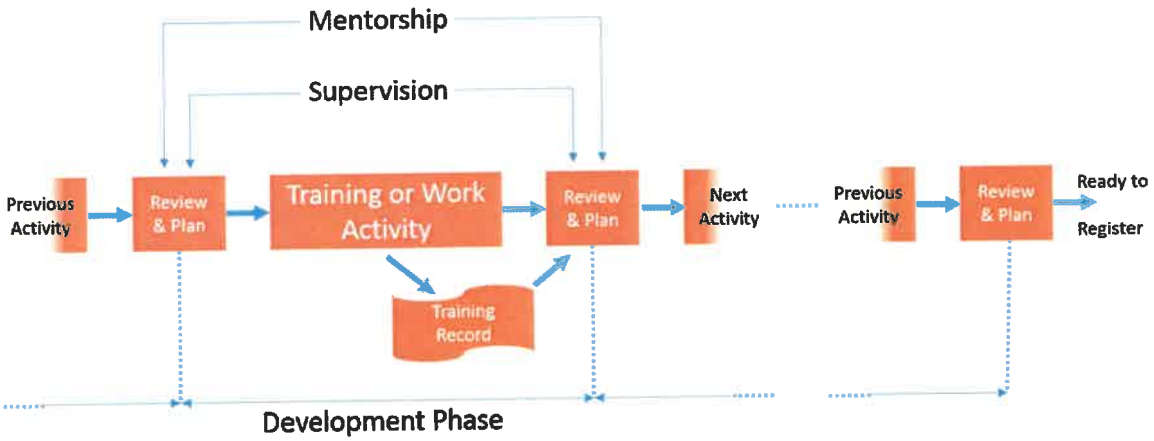

FIGURE 4: THE DEVELOPMENT PROCESS

To plan adequately it will be necessary to consider projects or tasks which must be carried out in the workplace, the level of responsibility the candidate should be working towards and the outcomes which must be developed per activity or task.

TRAINING PLAN

Activities

The ECSA training plan should be composed of activities relevant to local government, selected from the activities outlined in the R-02 series of documents i.e. activities include but are not limited to:

- design
- planning
- investigation and problem resolution (survey + analysis)
- improvement of materials, components, systems or processes (planning report)
- implementation, manufacture or construction
- engineering operations
- maintenance
- closure or disposal
- project management
- research and development
- commercialisation

Table 4 shows typical activities in the Local Government environment. When planning work for candidates, typical tasks which they may perform under each heading may be selected. It is not expected that they perform all the tasks shown, but sufficient tasks should be assigned to ensure that candidates can meet the outcomes. The Implementation versus Operations and Maintenance activities are shown as Electives. Candidates must be assigned activities under at least one of the two activities, if not both.

TABLE 4: TYPICAL ACTIVITIES AND TASKS TO BE PERFORMED BY ENGINEERING CANDIDATES

Core Activities			Electives	
I. **INVESTIGATION, PLANNING & RESEARCH**	II. **DESIGN, DEVELOPMENT & OPTIMISATION**	III. **PROCUREMENT & TENDERING**	IV. **IMPLEMENTATION**	V. **O&M**
Development Planning (IDP)	Investigation	Bill of Quantities	Construction and Manufacturing	Operations
Infrastructure Planning	Needs Analysis	Scope of Work and Specifications	Site Setup	Maintenance
Conceptualisation	Appropriate Technology	Tender Documents	Scheduling and Programming	Optimisation/Upgrades/ Improvements
Feasibility	Optimisation	Advertisements	Monitoring and Evaluation	Dispose/Decommission
Research and Development	Reporting	Evaluation, Adjudication and Award	Measurement	
	Detailed Design	Contract Documents	Quality Management	
			Risk and Safety Mitigation	
			Commissioning and Close-Out	
Cross-Cutting Activities				
VI. **ENGINEERING MANAGEMENT**	Reports – Business Plans – Customer Relations and Stakeholder Engagement – Communication – Infrastructure Asset Management – Environmental Impact Assessment – Resources – Project Management – Legal and Regulatory – Manage Service Providers – Personal			
VII. **FINANCE**	Budgeting – Costing – Financial Management – Funding – Lifecycle Costing – Certification			

Table 5 and Table 6 offer simple Training Plan on which to plan the candidate's work to ensure overall exposure to the phases of the project cycle. The activities at the top of the table are typical of what happens in each discipline and projects must be selected to address their requirements, including the achievement of the outcomes required.

Implementation, manufacture or construction as listed above are typical activities in which candidates can gain experience in scheduling and managing resources and managing the implementation process in general. They may, however, gain similar experience in engineering operations and maintenance, if fully immersed in this role. Work for candidates may therefore be planned in the implementation phase or in operations and maintenance, if the activities are sufficiently demanding to develop the ECSA outcomes. These two activities are marked with an asterisk (*). If they are only responsible for one of these activities, the other column may be deleted. Many candidates do, however, gain experience in both.

Although management experience will be gained when performing either of the activities discussed, it is important for mentors and supervisors to ensure that candidates are involved in engineering management rather than simply administration, to achieve Outcome 4. It is also important that candidates consider the funding aspects of projects, i.e. considering costs and managing project budgets, hence two additional activities have been added to the training plan as cross-cutting activities.

Responsibility

In planning work, it is essential that each subsequent activity ensures that candidates take increasing responsibility levels as shown in Table 2 which is extracted from the ECSA training guideline document, R-04-P.

TABLE 5: EXAMPLE OF TRAINING PROGRAMME PLANNING SHEET FOR CIVIL OR ELECTRICAL ENGINEERING CANDIDATES IN THE PUBLIC SECTOR

TICK ACTIVITIES UNDER RELEVANT COLUMNS, PER PROJECT. *NOTE: ONE OR OTHER ACTIVITY MAY BE ADEQUATE

Candidate name: _____ Discipline: _____

Organisation: _____

PROJECT Name & Number	PERIOD Start Date	Degree of Responsibility	Outcomes being worked towards	Investigation, Planning & Research	Design	Procurement & Contracts	*Construction/ Project Management	*O & M – Building & Industrial Services Reticulation	Engineering Management	Finance	Comments/description

Signature candidate: _____ Date: _____

Signature supervisor: _____ Date: _____

Signature mentor: _____ Date: _____

TABLE 6: EXAMPLE OF TRAINING PROGRAMME PLANNING SHEET FOR CHEMICAL OR MECHANICAL ENGINEERING

TICK ACTIVITIES UNDER RELEVANT COLUMNS, PER PROJECT. *NOTE: ONE OR OTHER ACTIVITY MAY BE ADEQUATE

Candidate name: _____ Discipline: _____

Organisation: _____

PROJECT Name & Number	PERIOD Start Date	Degree of Responsibility	Outcomes Being Worked Towards	Investigation, Research & Development	Design	Procurement & Contracts	* Manufacturing, Erection & Commissioning	*O & M incl. Optimisation Process/Plant Operation	Engineering Management	Finance	Comments/description

Signature candidate: _____ Date: _____

Signature supervisor: _____ Date: _____

Signature mentor: _____ Date: _____

Complexity

In planning work, it is essential that each subsequent activity is increasingly complex. The ECSA R-02 suite of documents defines the degrees of complexity for each category of registration as follows:

- **Engineer** – complex work (see clauses 2.1.2 and 3.1.1 of R-02-PE)
- **Engineering technologist** – broadly defined work (see clauses 2.1.1 and 3.1.1 of R-02-PT)
- **Engineering technician** – well-defined work (see clauses 2.1.1 and 3.1.1 of R-02-PN)

Meaningful engineering work must be planned that contributes to the problem-solving ability of the candidate. The work must be translated into tasks and engineering activities that demonstrate competence/functional competence at the desired level of complexity. Opportunities must be sought in the following:

- Identification and analysis
- Planning
- Design
- Construction
- Operations and/or maintenance

COMPLEXITY OF ENGINEERING ACTIVITIES

Table 7 indicates the levels of complexity for the scope of work (activities), and the following should be considered, for each category of registration:

- Contextualisation of the work/task and the complexity
- Identification and management of resources
- Interactions and theoretical considerations
- Constraints and impacts
- Risks and consequences

Table 7 compares the differences between the complexity of scope, context, resource management, interactions, constraints, risks and consequences for engineers, technologists and technicians.

Engineering tasks and activities must be planned for the candidate in accordance with the complexity requirements of his/her category of registration. Furthermore, the mentor and supervisor must ensure that the candidate performs, considers and applies the following:

- Understands the scope and contextualise the task/assignment
- Applies theory by considering interactions between a range of scenarios/variables
- Identifies and manage resources, including technologies
- Considers and applies measures to mitigate constraints, risks and consequence of the specific activity

TABLE 7: COMPARISON OF COMPLEXITY OF ACTIVITES BETWEEN LEVELS OF REGISTRATION

ENGINEER	TECHNOLOGIST	TECHNICIAN
(a) Scope of activities may encompass entire complex engineering systems or complex subsystems;	(a) Scope of practice area is linked to technologies used and changes by adoption of new technology into current practice;	(a) Scope of practice area is defined by techniques applied; change by adopting new techniques into current practice;
(b) A context that is complex and varying, is multidisciplinary, requires teamwork, unpredictable, may need to be identified;	(b) Practice area is located within a wider, complex context, requires teamwork, has interfaces to other parties and disciplines;	(b) Practice area is located within a wider, complex context, with well-defined working relationships with other parties and disciplines;
(c) Requires diverse and significant resources: including people, money, equipment, materials, technologies;	(c) Involve the use a variety resources (including people, money, equipment, materials, technologies);	(c) Work involves familiar, defined range of resources (including people, money, equipment, materials, technologies);
(d) Significant interactions exist between wide- ranging or conflicting technical, engineering or other issues;	(d) Require resolution of occasional problems arising from interactions between wide-ranging or conflicting technical, engineering or other issues;	(d) Require resolution of interactions manifested between specific technical factors with limited impact on wider issues;
(e) Are constrained by time, finance, infrastructure, resources, facilities, standards & codes, applicable laws;	(e) Are constrained by available technology, time, finance, infrastructure, resources, facilities, standards and codes, applicable laws;	(e) Are constrained by operational context, defined work package, time, finance, infrastructure, resources, facilities, standards and codes, applicable laws;
(f) Have significant risks and consequences in a range of contexts.	(f) Have significant risks and consequences in practice area and in related areas.	(f) Have risks and consequences that are locally important but are not generally far reaching;

COMPLEXITY OF ENGINEERING PROBLEM SOLVING

To test the complexity of problem solving, it will be necessary to:

- Establish whether a problem is, in fact, an **engineering problem** requiring engineering knowledge. For example, a person performing only project management functions with no role in the engineering aspects of a project would not be solving an engineering problem.

- Establish the factors describing complexity of the **initial state** and the desired end state of the problematic situation; how many factors are known or specified, what is unknown, are there multiple goals?
- Test the complexity of the **solution path or process** from initial state to the goal state
- Test the **level of decision making** needed in the process and possible consequences for which responsibility must be taken

Complexity of problem solving is covered in detail in Table 9, Table 10 and Table 11 in Section 4: Assessments.

WATER EXAMPLE

Table 8 provides typical scopes of work that would be given to an engineer, technologist or technician, in relation to providing water to a township. The scope given to the technician is well defined, will require limited investigation and is largely procedural. The scope for a technologist will require investigation and the application of theoretical knowledge, whilst the scope for the engineer will require considerable research, conceptualisation, design and dealing with multiple stakeholders.

TABLE 8: EXAMPLES IN COMPLEXITY

ENGINEER	TECHNOLOGIST	TECHNICIAN
(a) Scope: Provide bulk and internal water infrastructure for a new township development in accordance with the Integrated Development Plan and Spatial Development Framework. The overall project will have numerous projects and many professional service providers (b) Context: The project has not been conceptualised and the service provision parameters are unknown. Other complex and multidisciplinary requirements are not known and a built environment professional team will have to be assembled. Other context variables that will need to be considered are: ▪ The Spatial Development requirements are not known	(a) Scope: Design the internal reticulation for a township development of 500 erven, including social, commercial and retail facilities and infrastructure. (b) Context: The project is being investigated and conceptualised internally. Other context variables are: ▪ It may need to be outsourced for detailed design ▪ The municipality is not the Water Service Authority or Water Service Provider ▪ Interaction is required with some other departments and/or Waterboards ▪ The availability of bulk supply is not known (c) Resources: Might require the establishment of a	(a) Scope: Design the internal reticulation for 100 households for 60 l per person per day (b) Context: The project is internal and no service providers have been appointed. Other context variables are: ▪ The supply is internal and the municipality is the Water Service Provider ▪ There is adequate bulk supply ▪ Input from other departments and consideration are known (c) Resources: The technical team is known and in- house. Other resources considerations are:

- The land use requirements have not been specified
- A water services analysis needs to be performed
- The requirements to meet the resident, retail, commercial and/or industrial needs are not known
- The remaining useful life of existing infrastructure is not known and will require an infrastructure asset management investigation
- The bulk provision requirements are not known
- The storage and pumping requirements and availability of existing infrastructure has not been determined
- No servitudes and rights of way have been identified and/or conceptualised
- The levels of service have not been determined
- The geotechnical requirements are not known
- The loss and demand management requirements have not been determined
- A hydrological model and ground water protocol needs to be established
- There is no Environmental Impact Assessment
- The parameter and variables for conceptualisation, investigation, planning, and design have not been established

(c) ... (d) ... (e) ... (f) ...

professional team including other engineering and built environment disciplines. Other resource considerations are:

- The budget has been estimated and cost alternatives need to be developed.
- Multi annual funding and phasing may be required. Appropriate technology and specifications are evident but not known.
- The specifications for pipes and fitting are not known and alternatives will need to be specified.
- Construction method alternatives may need to be investigated and developed

(d) **Interactions**: The following wide ranging technical and engineering issues will require resolution:

- Conditional and capacity assessments on existing infrastructure and supply
- Determine resident needs
- Determine design standards
- Undertake broadly defined hydraulic design
- May require network analysis
- Determine and implement pressure management
- Determine the daily/peak demand and storage
- Specify pumping and reticulation requirements of a specific zone
- Etc...

(e) ... (f) ...

- Limited interaction with other disciplines and departments
- The budget is known
- The technology and class of pipes and fitting is standardised.
- The method of construction is identified and/or known

(d) **Interactions**: The main considerations are the technical issues, such as:

- Consider pressure management requirements
- Understand the bulk availability requirements
- Determine peak and daily demand of a specific Part of or reticulation zone
- Determine losses in a specific reticulation zone
- Undertake well defined hydraulic design within known parameters
- Consider pressure management requirements
- Consider pumping and reticulation requirements of a specific zone
- Calculate steady state fundamentals within known parameters
- Consider known water hammer, air entrapment and anchoring requirements

Other issues to consider in relation to the above will be:

- The implementation of optimisation of flocculation, settlement and ... Etc...

(e) ... (f) ...

DURBAN CORPORATION 1979

The following training plan is a classic. It was prepared at a time when structured workplace training was relatively new and organisations were tasked with submitting plans to the predecessor of ECSA for approval before being implemented. The plan considered all the branches within Durban City Engineers and suggested activities which would be suitable for training. It also doubled as a training document as it gave graduates-in-training of the time, guidelines on what to consider under each activity. The suggestions echo the 11 ECSA Outcomes and also talk to the definitions of complexity.

Hydraulics Branch	Water Supply Branch	Works and Housing Branch Construction Division	Roads Branch	Traffic and Transportation Branch
PROBLEM SOLVING				
Problem formulation Engineer-in-training (EIT) should prepare statement that clearly defines parameters laid down for achieving design and/or construction or for meeting required end result. All constraints should be included. Important to state parameters and constraints initially. In addition, new parameters and constraints should be added during course of investigation.	**Problem formulation** **Design:** Determine long-term city growth and changes in area zoning (business, residential). Request information on reticulation networks from Operations. **Operations:** Investigate water reticulation problems and determine solutions within constraints of water reticulation system.	**Problem formulation** Obtain plans from designers. Do site inspection of work. (EITs in Construction Division work on capital projects ranging in costs from R80 000 to R2 million.)	**Problem formulation** Investigate and determine structural systems and choose materials. Analyse road failures and determine remedial works.	**Problem formulation** **Traffic engineering:** Investigate and determine problem areas with respect to road capacity, route location, hazardous location and traffic control systems. **Investigation of complaints:** For all modes of travel, public and private.
Finding and using information Following completion of statement, data must be gathered using all sources, such as correspondence files, record drawings, technical library, verbal discussions and external sources (such as plant suppliers).	**Finding and using information** **Design:** Water consumption trends (using computer data) Analyse flow characteristics. Request Operations to conduct field tests to confirm that calculations comply with SABS standards. **Operations:** Contact appropriate people for advice on for example parts to be made and spares.	**Finding and using information** **Sources:** Technical literature, senior staff.	**Finding and using information** **Sources:** Codes of practice and handbooks. Conduct tests in accordance with SABS methods.	**Finding and using information** **Sources:** Do literature searches, traffic surveys, and interview surveys to determine existing and potential needs/situations.
Application of engineering principles Apply correct engineering principles on basis of problem and data collected.	**Application of engineering principles** Principles of hydraulics, strength of materials, corrosion control, structures and computer analysis.	**Application of engineering principles** Handbooks, codes of practice, computers and experience of other engineers.	**Application of engineering principles** Compaction, use of plant, etc.	**Application of engineering principles** Handbooks, manuals of standard practice, computing techniques and experience of other local engineers.

Hydraulics Branch	Water Supply Branch	Works and Housing Branch Construction Division	Roads Branch	Traffic and Transportation Branch
DECISION MAKING				
Types of decision Evaluate various inputs and their relative importance to reach a decision. Often detailed design is done unnecessarily at an early stage before initial decisions are made which make such detailed design redundant.	**Types of decision** **Design:** Choice of materials (such as size of pipe), reticulation layout, positions of control valves. **Operations:** Conflicting priorities (for example, decide on most urgent of ten problems). Decisions usually have to be made on the spot.	**Types of decision** Determine structural system. Choice of materials. Type of founding (for example, spread footing or piles).	**Types of decision** Largely organisational, for example organising work to be carried out in respect of plant, materials and staff.	**Types of decision** Formulate alternative systems and select optimal solution.
Scientific consideration Apply correct scientific/ engineering design criteria to problem. Important to utilise design aids rather than to work from first principles.	**Scientific consideration** **Design:** Evaluate new materials or control valves.	**Scientific consideration** (Not as extensive as in Design.)	**Scientific consideration** Consider durability.	**Scientific consideration** Capacity analysis, computer modelling techniques based on data collected, accident analysis, future projections (forecasting from trends).
DECISION MAKING				
Economic considerations Important to realise economic results of design proposals and refine parameters to give most economic end result.	**Economic considerations** **Design:** Materials and pipe network to be cost effective. **Operations:** Economic consequences always a factor in determining priorities, for example cannot test systems on weekdays for this would stop factory production.	**Economic considerations** Consider different materials and structural forms. Compare price of alternative schemes.	**Economic considerations** Estimate project costs based on drawings. Compare costs of alternative materials.	**Economic considerations** Cost/benefit analysis of alternatives.
Practical considerations Practical implications of any design solution is important, particularly in respect of on-going maintenance, repairs, accessibility, etc.	**Practical considerations** **Design:** Ease of construction and future maintenance. **Operations:** Take decisions within time frame of ongoing water distribution network. Time and limitations of plant and terrain are important in emergencies.	**Practical considerations** Various	**Practical considerations** Ease of construction, future maintenance, speed of construction.	**Practical considerations** Ease of implementation and maintenance, timing of implementation (for example, this year or next year?).

Hydraulics Branch	Water Supply Branch	Works and Housing Branch Construction Division	Roads Branch	Traffic and Transportation Branch
Social considerations Ensure that proposed solution does not affect environment or, if it does, minimise such effects. Also ensure there are no bad social effects during construction or afterwards, such as high noise level, particularly in residential areas and after hours, odour problem, unsightly security precautions.	**Social considerations** **Design:** Moral responsibility to supply water demands that any design provide for construction of duplicate mains and alternative systems of supply. **Operations:** Consequences of priority selection for convenience of public.	**Social considerations** Noise and safety factors.	**Social considerations** Choose construction methods that limit noise, dust, and vibration. Consider safety and aesthetics.	**Social considerations** Social benefits. Factors such as pollution, disruption, safety and inconvenience are important.
Checking data and conclusion On conclusion of all design work it is essential to recheck against original brief, to ensure that data has been used correctly and to come to correct conclusion. Formulate recommendations clearly and succinctly.	**Checking data and conclusion** **Design:** Check calculations in house after checking in field. **Operations:** In case of a problem: identify where it lies, take steps to rectify and follow up with flow and pressure tests and pressure recording charts (under direction of engineer). Pass temporary solution on to Design for detailed investigation of ultimate solution.	**Checking data and conclusion** Routine procedure for all structural design. Especially important when working with computers. Engineers are taught never to accept results without checking.	**Checking data and conclusion** Check daily against conclusions.	**Checking data and conclusion** Check data for accuracy. Do computer output consistency tests.
PREPARATION AND PLANNING OF PROJECTS				
Types of project Sewerage reticulation, pump stations, trunk sewers, sewer flow analysis, catchments analysis, treatment works, design incorporating, screening aeration, sedimentation, digestion, sludge dewatering, maturation ponds, etc. Stormwater flow analysis, culverts, canals, beachfront structures, flood line analysis, statistical analysis, river control measures, sand movement analysis.	**Types of project** **Design:** Structural design of reservoirs, pipe crossings of rivers, reticulation networks. **Operations:** Telemetry – computer work and design expansion of system. Water zoning and implementation of double hydrant system. Control of reticulation system during water restrictions. Putting out and monitoring of contracts for control valves. Operating Dunkeld and Montille reservoirs.	**Types of project** Structural design of municipal buildings, reservoirs, sewerage works, retaining walls, bridges (road and pedestrian), electricity sub-stations, roads, foundations.	**Types of project** Major roads, stormwater drains and pipes, kerbing and channelling.	**Types of project** Road intersections, public transport facilities, traffic management systems, control systems.

Hydraulics Branch	Water Supply Branch	Works and Housing Branch Construction Division	Roads Branch	Traffic and Transportation Branch
Design work Hydraulic and structural design associated with the above projects, together with statistical analysis.	**Design work** **Design:** Structural design of projects as above. **Operations:** Determine practical limits of zone by considering contours and pipe reticulation and undertaking field tests of water pressure.	**Design work** Various	**Design work** Structural design of projects as above, including detailed design and preparation of reinforcing schedules. Foundation designs based on soil investigations.	**Design work** Roads and public transport facilities. Detailed design of traffic signal control systems.
Planning of work Prepare programme that indicates steps necessary to achieve end result. This means being able to recognise critical path at any stage of project.	**Planning of work** Plan so as to take traffic conditions into account to ensure supply is maintained. Warn public before shutting down mains and arrange alternative sources of supply if possible.	**Planning of work** Plan project in respect of organisation, plant, materials and staff.	**Planning of work** Plan project to suit construction procedures, traffic conditions, future additions, etc.	**Planning of work** Plan roads and public transport facilities, and traffic control systems utilising computer models.
Specifications Essential, where necessary, to be able to specify work to be carried out. Use previously drawn-up specifications but critically analyse these with a view to improvement. Seek specialist advice where item required has not been previously specified.	**Specifications** **Design:** Preparation of project specifications. **Operations:** Advice to Design Section on practical aspects of specifications.	**Specifications** Carry out work in accordance with specifications.	**Specifications** Prepare project and road specifications.	**Specifications** For traffic operations and management, draw up specifications for signals, computer systems, parking meters, signs, etc.
Estimates Importance of realistic estimating must be recognised. Ensure that, besides bare project costs, all other incidental costs are included, for example contingencies, establishment, departmental works and landscaping.	**Estimates** Prepare estimates and schedules of materials.	**Estimates** Cost control, in conjunction with departmental accountant, to estimate costs of all work to be carried out.	**Estimates** Prepare estimates and schedules of quantities, when required.	**Estimates** Prepare budget estimates for roadworks and for traffic control systems.
EXECUTION OF PROJECTS				
Types of project Physical projects, as above.	**Types of project** As above.	**Types of project** As above.	**Types of project** As above.	**Types of project** As above.
Experience of different materials Familiarity with different	**Experience of different materials** Reinforced concrete,	**Experience of different materials** Reinforced concrete,	**Experience of different materials** Reinforced concrete,	**Experience of different materials** Not applicable.

Hydraulics Branch	Water Supply Branch	Works and Housing Branch Construction Division	Roads Branch	Traffic and Transportation Branch
materials used to solve particular problems, for example steel pipes, asbestos cement, UPVC and HDPE.	pipes (stainless steel, cast iron, asbestos cement, copper, PVC), rubber gaskets, pump seals.	structural steelwork, structural timber, load-bearing bricks and blocks, soils, asphalt and aggregates.	pre-stressed concrete, structural steelwork, structural timber, load bearing bricks and blocks, soils, asphalt and aggregates.	
People contact Ability to relate to other people in order to involve all in problem solving and awareness of input required from others, whether small or large.	People contact Public, architects, consultants, electricians, legal (such as Factories and other Acts), staff (own section and department, other departments).	People contact Public, designers, service organisations, General Post Office, electricity department foreman and artisan staff.	People contact Liaise with architects and quantity surveyors. Interdepartmental consultations with other branches and representatives of other departments. Supervise subordinate staff (that is, technicians and draughtsmen).	People contact Liaise with public, traffic police, town planners, architects, bus operators, SA Transport Services and all engineering disciplines (including City Electrical Engineer), other staff (labourers, artisans) and suppliers of equipment. Involvement with inter-departmental liaison committee.
ACCEPTANCE OF PROFESSIONAL RESPONSIBILITY				
Essential that EIT assume professional responsibility for his work and, if challenged, be able to justify recommendations and parameters, and be prepared to stand up for his proposals.	Supervised, but EIT must make decisions on his own within a few weeks.	Full responsibility for carrying out work in accordance with design.	Accept responsibility for structural adequacy of own design under supervision of professional engineers.	Responsible for design.
CONDUCT				
EIT to conduct himself with decorum at all times in discussing with, instructing and relating to other people of all races and educational levels. Should not be in fear of superiors but prepared to meet them and discuss matters with dignity.	Must prove stable and not panicky for he often has nobody to fall back on. Leadership and mature judgement required.	Expected to have organisational ability and to be capable of motivating people.	Conduct expected of an engineer.	Conduct expected of an engineer.

PROBLEM SOLVING

The emphasis of reporting in the TER is to describe how the candidate solved problems for each period. This also applies to the Engineering Report. Problem solving involves:

- Identifying and analysing the problem

- Developing and comparing possible solutions
- Designing, specifying and costing the selected solution
- Managing the implementation of the solution
- Evaluating work and making recommendations

Typically engineering problems could be:

- An engineering task that the candidate was requested to investigate or develop a solution for
- An engineering task the candidate identified him/herself
- A priority the candidate determined out of a maintenance management system or capital programme
- A specific construction activity that the candidate took responsibility for (typically contingencies and variations)
- A repair, emergency and/or failure
- Situational management
- An improvement to the performance or level of service of infrastructure
- A financial or engineering management activity

The following steps are a guide to determine the problem, complexity and decision making required to solve the problem:

- Establish whether a problem is, in fact, an engineering problem that requires engineering knowledge. For example, a person performing only project management functions with no consideration of the engineering aspects of a project would not be solving an engineering problem.
- Identify the factors describing complexity of the initial state/situation and the desired end state/situation of the problematic situation; how many factors are known or specified, what is unknown and are there multiple goals?
- Test the complexity of the solution or process from the initial state to the goal state and/or end-result.
- Determine the level of decision making needed in the process and possible consequences for which responsibility must be taken.

To clearly understand a problem and systematically identify, analyse and solve problems, the candidate needs to understand what a problem is and what the requirements are for problem solving:

- **Problem solving –** is the act of defining a problem; determining the cause of the problem; identifying, prioritising and selecting alternatives for a solution; and implementing a solution
- **Engineering problem –** means a problematic situation or need that is amenable to analysis and solution using engineering sciences and methods

Effective problem solving takes time and attention, more of the latter than the former. Paying attention to detail will take much less time than is required to rectify a problem not well solved.

Problem identification

To develop competence in problem identification, the candidate must be able to:

- Identify problems in his/her current work situation, and duties
- Identify engineering activities that can be formulated into problems
- Develop broad problem statements for current and future opportunities

Because people are born problem solvers, the biggest challenge is to overcome the tendency to immediately come up with a solution. To ensure that problems are adequately identified and conceptualised, the candidate must:

IDENTIFY THE ISSUES

- **The problem** – be clear about what the problem is, a service failure, need for infrastructure, optimisation, expansion or improvement of a level of service
- **Stakeholders** – remember that different people might have different views of what the issues are, such as:
    - The public/consumers and political/social structure
    - The community
    - National departments
    - Provincial departments
    - Departments within the municipality
    - Industry
    - Commerce, including retail
- **The IDP** – most of the views, wishes and requirements are contained in the IDP. The IDP must be consulted when developing scenarios for problem resolution to ensure that the solution is in accordance with what has been planned and budgeted for
- **Townplanning requirements** – to establish the parameters for engineering services and infrastructure the SDF and LUM must be consulted to ensure that the solution is in line with the development that has been zoned for that specific area. The availability of services and additional demand must be compared to the land use and bulk provisioning that is reserved for that specific area

Consult and separate the list of issues from the identification of interests.

UNDERSTAND EVERYONE'S INTERESTS

- Interests are the needs that must be satisfied by any given solution. Do not ignore the true interests as we often become attached to a predetermined solution
- The best solution is the one that satisfies everyone's interests

LIST THE POSSIBLE SOLUTIONS (OPTIONS)

This is the time to brainstorm. There may be lots of room for creativity and an opportunity to demonstrate the candidate's engineering analysis. Separate the list of options from the evaluation of the options.

Remember, the emphasis is on engineering problem solving. The candidate needs to test the problem and possible solutions for theory and engineering fundamentals before proceeding.

Despite the candidate's best intentions and consideration – **"Water cannot flow uphill"**

EVALUATE THE OPTIONS AND DEVELOP A SOUND PROBLEM STATEMENT

The candidate must separate the evaluation of options from the selection of options and develop comprehensive problem statements by:

- Giving a detailed description of the problem
- Describing the results they want to achieve
- Describing the information required and the analysis/investigation process followed
- Identifying possible solutions that they are working towards

Sound problem identification and formulation are essential for successful problem solving. The candidate must have a clear understanding of the problem before analysis and design of a solution can take place.

Problem analysis and solution

Figure 5 will guide the candidate in the analysis and development of solutions:

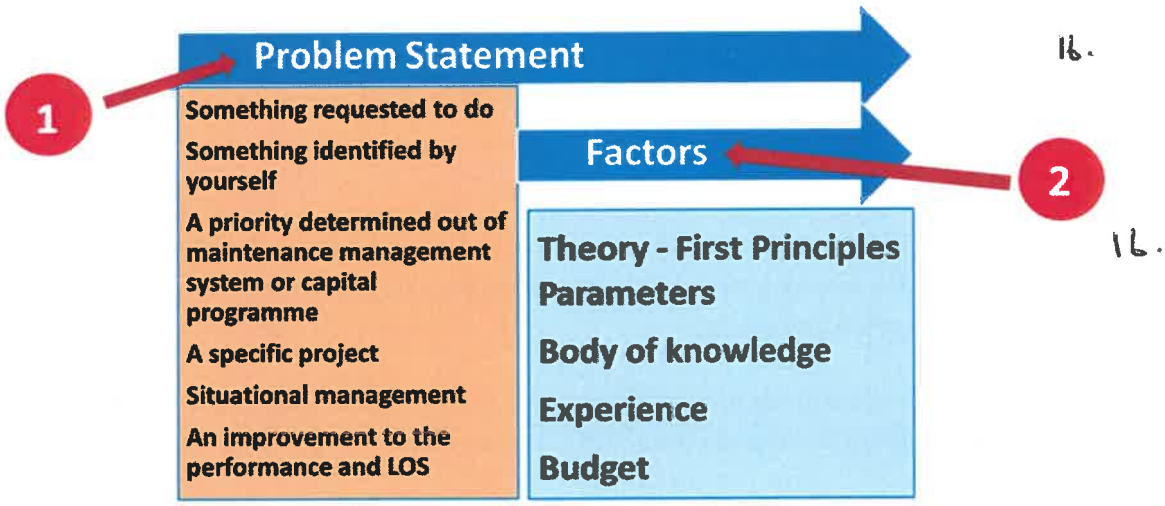

FIGURE 5: GUIDE TO ANALYSING AND DEVELOPING SOLUTIONS

1 – PROBLEM STATEMENTS

The candidate's problem statement must indicate a clear understanding of the problem and specific contribution. The statements must indicate the following:

- What the candidate was requested, or tasked to do
- What operational or infrastructure inefficiency the candidate identified
- A priority that the candidate determined out of a master plan, asset management system, IDP, the SDF/LUM and/or a developer proposal

- A problem encountered on a specific project and/or programme. Try and focus on variations and contingencies or a defined change in scope of work
- Any problem or situation that arose from an operation, service or incident that resulted in a failure or lack of service provision, such as flooding, major water and electricity outages, traffic congestion and/or lack of access
- A problem that the candidate identified in a level of service and the measure identified and analysed to improve or optimise the service.

The candidate must translate the problem into specific engineering activities, and ensure that one or more are included in the problem statement:

- Investigation
- Feasibility
- Planning
- Design
- Construction
- Operations
- Maintenance
- Commissioning
- Close-out and retention

To ensure that the candidate gives an indication of the order and magnitude to the problem, some of the following must be included in the statements:

- Dimensions
- Volumes
- Distance
- Value, etc.

The candidate must not include analysis, solution activities and tasks in the problem statement. The problem statement is intended to indicate the candidate's understanding of the problem and what issues are to be analysed and solved.

The candidate must avoid giving project descriptions and instructions/operational information. There are only 20 to 30 words, so focus on the activity, scope, magnitude and complexity of the problem.

2 – FACTORS

Once the problem has been identified as an **Engineering Problem**, it will be necessary to determine which **Engineering Activities** must be executed to solve the problem.

Furthermore, all the issues, interests, views, opinions and perceptions and expectations of concerned parties must be considered. Ultimately the candidate would have identified planning and regulatory constraints. These are the scenarios and parameters within which they will be analysing and developing alternate solutions. Briefly mention the most important issues in the opening statement for analysis.

The candidate must not restrict analysis to institutional constraints. Alternate solutions should be developed considering indirect impacts and constraints and the optimum solution should be selected.

Analysing a problem is a rational and methodical process. The candidate must be concise and follow the order indicated in Figure 5. This is very important as it is a constant test for viability. The candidate must consider the following factors:

- **Theory/First Principles** – Recall the specific subject and curriculum studied and draw on **first principles** to test for theoretical viability. Each engineering sub-discipline has its own theoretical considerations.

Determine and record the theory which will govern the solution.

- **Parameters** – consider the range of parameters and decide which will form the basis for analysis, such as:
  - Pressure, flow, losses, volume, mass, demand, discharge
  - Load, traffic volumes, traffic growth and geometric considerations
  - Material selection and strength of materials, etc.
  - Power, current, voltage, capacitance, resistance, frequency
  - Load, force, torque

Determine and record the demands and other parameters which must be considered.

- **Body of knowledge** – engineering is a well-established profession based on sound theoretical principles. However, many practical aspects also need to be considered. It is essential that the candidate consults with the mentor, seniors or experts to gain an understanding of what works and what does not, as well as any practical considerations that may have he/she may have overlooked or not be aware of.
- **Experience** – candidates should draw on their own experience and the experience of others to test their theory, applicable parameters and practical elements to be considered. They should discuss the rationale with fellow engineering practitioners, manufacturers and suppliers and should not forget to discuss what they have in mind with operators, fabricators and constructors.
- **Budget** – every engineering solution and activity has a cost implication. The candidate must always strive to offer the best solution, at the right price, on time and to specification. They should test the factors against the capital and operational budget and ensure that what they are proposing can be built and operated cost effectively.

At this stage, the candidate will have a clear idea if the initial assumptions, issues, interests and parameters decided on are theoretically viable and are sound from an experience and body of knowledge perspective. If not, they should revisit the problem identification and establish if they have misinterpreted or missed something. They should not continue with their analysis if they are uncertain.

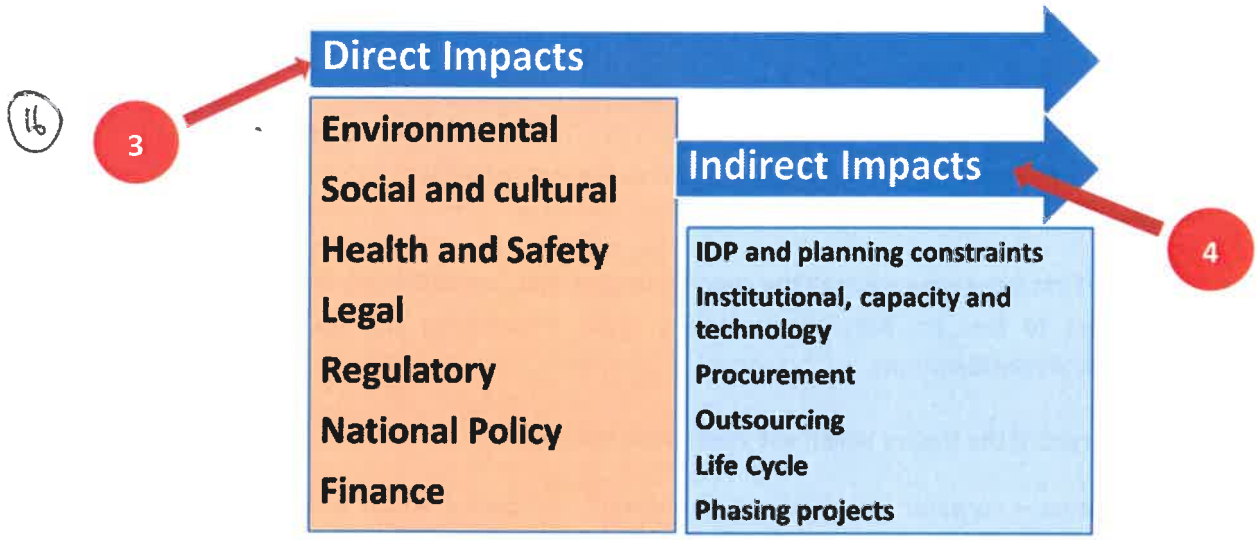

FIGURE 6: DIRECT AND INDIRECT IMPACTS

3 – DIRECT IMPACTS

If problem identification, issues, interests and concerns have been tested against the engineering/theoretical factors and the parameters/scenarios have been finalised, the candidate can start to analyse the direct impacts contained in Figure 6.

The candidate must choose at least two of the most prominent and deciding scenarios and test them against the following direct impacts:

- **Environmental** – ensure that the options chosen meet the requirements of all environmental legislation and consider the following:
  - Water Act for final water quality and drinking water quality
  - Minerals Act for borrow pits and records of decision for construction and excavation
  - Activities in coastal and riverine areas and spaces, etc.
- **Social and cultural** – consider all growth and development strategies, poverty alleviation and social programmes contained in:
  - The Provincial Growth and Development Strategy
  - Social development strategies in the IDP
  - RDP standards and free basic services requirements

  Pay specific attention to community, cultural and social activities/events and their requirements.
- **Health and safety** – the impacts are not restricted to construction and operations. The candidate must consider public health and safety and test solutions against all public activities, use and exposure.
- **Legal, Regulatory and National Policy** – test solutions against the legal and regulatory requirements. Consider the following for compliance:
  - The Water Act
  - The National Sanitation Policy
  - The Constitution
  - The Transportation Act

- The Mines and Mineral Act
- The Environmental Management Act
- Municipal By-Laws
- All Ordinances and National Directives

Ensure that they meet the requirements for grant funding.

- **Finance** – in the problem identification and analysis, the candidate considered the cost implication. External funding may be required or it may be necessary to seek an alternative to be within budget.

The candidate must decide on, and record, the most prominent direct impact factors which cannot be accommodated. If the possible solutions do not meet the above, the candidate may need to revisit the problem identification and analysis, or develop mitigation measures for consideration.

The candidate should have noticed by now that problem analysis and the development of solutions is a constant feed-back loop of reaffirming the problem identification, analysis and impacts.

4 – INDIRECT IMPACTS

After constantly revisiting the problem identification, analysing and considering the impacts, the candidate ought to have arrived at a minimum of two possible and alternate solutions. Once the solutions have been developed and refined, the candidate will need to institutionalise the solution and seek approval.

The following will need to be considered to analyse any indirect impacts for institutional viability in order to prepare a proposal for approval:

- **IDP and Planning** – revisit the IDP and ensure that the solution is fit for purpose and that it is accommodated in the following:
  - Growth and Development Strategy
  - Spatial Development Framework
  - Land Use Management Plan
  - Sector Development Plans
  - Integrated Plans
  - Master Plans
- **Institutional capacity and technology** – test if there is institutional capacity, and there are resources, to implement, operate, manage and maintain the solution. Ensure that there is the skill to implement/commission, operate and maintain the technology selected
- **Procurement and outsourcing** – establish what services and products need to procured/outsourced and ensure that there is capacity to manage the service providers. Make sure that outsourcing costs fall within budget
- **Asset management and life cycle** – determine the remaining useful life of existing infrastructure and perform a conditional assessment. Ensure that the existing infrastructure has adequate remaining useful life to accommodate the life of new infrastructure and/or improvements. Develop an operations and maintenance proposal, and associated cost thereof

- **Phasing of projects** – decide whether the solution can be implemented in the current financial year and Medium Term Expenditure Framework (MTEF) period. If not, develop the candidate's solutions in phases, over numerous financial years

Once the above have been determined, the candidate should select the best option considering the factors and impacts.

Evaluation, judgement and decision making

After this exhaustive process of identification, analysis and considering the impacts, the candidate must evaluate their work, review the overriding factors, direct and indirect impacts, to ensure that due consideration has been taken in selecting the most appropriate solution.

They must then motivate the solution by comparing it to the requirements established when the problem statement was conceptualised.

By evaluating alternatives and giving reasons for choosing the most appropriate outcome, the candidate will demonstrate his/her judgement and decision making.

4. Assessment

The competence developed is based on the ability to identify, analyse and solve problems by applying theory at the desired level, within the range of work for the category of registration, and considering the impacts of the activities in applying judgement and making responsible decisions.

Mentors must constantly be cognisant of the levels of responsibility and complexity that the candidate is working at, when carrying out assessments. From the mentor perspective, there is a tendency to apply engineer standards to technologists and technicians. From the municipal perspective, there is often the danger that candidates are assigned specific work i.e. procedural work at the level of an artisan, and are not adequately challenged to investigate and solve problems. Mentors must ensure that they apply the definitions and standards for complex, broadly defined and well-defined activities.

COMPLEXITY OF ENGINEERING ACTIVITIES

To test whether the activities are at the correct level of complexity, refer to Table 7.

COMPLEXITY OF ENGINEERING PROBLEM SOLVING

The following steps are a guide to determine the problem, complexity and decision making:

- Establish whether a problem is, in fact, an **engineering problem** by virtue of requiring engineering knowledge. For example, a person performing only project management functions with no role in the engineering aspects of a project would not be solving an engineering problem.
- Identify the factors describing **complexity** of the **initial state** and the desired **end state** of the problematic situation; how many factors are known or specified, what is unknown and are there multiple goals?
- Test the complexity of the **solution path** or **process** from initial state to the goal state.
- Determine the **level** of **decision making** needed in the process and possible **consequences** for which responsibility must be taken.

To test the complexity of engineering problem solving, consider the scenarios for Engineers, Technologists and Technicians as shown in Table 9, Table 10 and Table 11.

TABLE 9: ENGINEER – COMPLEX PROBLEM SOLVING

Test	Characteristics
Is the problem **an engineering problem**? Does it:	(a) require in-depth fundamental and specialized engineering knowledge;
What is the **nature of the problem** in order to **establish complexity**? Does it have one of characteristics b, c or d?	(b) is ill-posed, under- or overspecified, requiring identification and refinement; (c) is a high-level problem including component parts or sub-problems; (d) is unfamiliar or involves infrequently encountered issues;
What is encountered in the **solution process**? Do solutions have one of characteristics e, f, g or h? Solutions:	(e) are not obvious, require originality or analysis based on fundamentals; (f) are outside the scope of standards and codes; (g) require information from variety of sources that is complex, abstract or incomplete; (h) involve wide-ranging or conflicting issues: technical, engineering and interested or affected parties;
What is involved in **decision making** while solving the problem and in evaluating the solution? Does it have one of characteristics i or j? Do decisions:	(i) require judgement in decision making in uncertain contexts; (j) have significant consequences in a range of contexts.

TABLE 10: TECHNOLOGIST – BROADLY DEFINED PROBLEM SOLVING

Test	Characteristics
Is the problem **an engineering problem**? Does it:	(a) require coherent and detailed engineering knowledge underpinning the applicable technology area;
What is the **nature of the problem** in order to **establish complexity**? Does it have one of characteristics b, c or d?	(b) are ill-posed, or under or overspecified, requiring identification and interpretation into the technology area; (c) encompass systems within complex engineering systems; (d) belong to families of problems which are solved in well-accepted but innovative ways;
What is encountered in the **solution process**? Do solutions have one of characteristics e, f, g or h? Solutions:	(e) can be solved by structured analysis techniques; (f) may be partially outside standards and codes (must provide justification to operate outside); (g) require information from practice area and sources interfacing with practice area that is complex or incomplete; (h) involves a variety of issues which may impose conflicting constraints: technical, engineering and interested or affected parties;
What is involved in **decision making** while solving the problem and in evaluating the solution? Does it have one of characteristics i or j? Do decisions:	(i) requires judgement in decision making in practice area, considering interfaces to other areas; (j) have significant consequences which are important in practice area, but may extend more widely.

TABLE 11: TECHNICIAN – WELL-DEFINED PROBLEM SOLVING

Test	Characteristics
Is the problem **an engineering problem**? Does it:	(a) can be solved mainly by practical engineering knowledge, underpinned by related theory;
What is the **nature of the problem** in order to **establish complexity**? Does it have one of characteristics b, c or d?	(b) are largely defined but may require clarification; (c) are discrete, focussed tasks within engineering systems; (d) are routine, frequently encountered, may be unfamiliar but in familiar context;
What is encountered in the **solution process**? Do solutions have one of characteristics e, f, g or h? Solutions:	(e) can be solved in standardized or prescribed ways; (f) are encompassed by standards, codes and documented procedures (requires authorization to work outside limits); (g) information is concrete and largely complete, but requires checking and possible supplementation; (h) involve several issues but with few of these imposing conflicting constraints and a limited range of interested and affected parties;
What is involved in **decision making** while solving the problem and in evaluating the solution? Does it have one of characteristics i or j? Do decisions:	(i) requires practical judgement in practice area in evaluating solutions, considering interfaces to other roleplayers; (j) have consequences which are locally important but not far reaching (wider impacts are dealt with by others).

ECSA OUTCOMES

When assessing the outcomes, the mentor should consider the written version of experience in the TERs that have been submitted and reviewed as well as consider the candidate's understanding of the work he or she is doing, as experienced during meetings, site visits, discussions with contractors, service providers etc.

Report writing may be poor in the initial stages, therefore, a fair amount of interrogation and discussion will be required for each outcome. Use the nature of problems in Table 9, Table 10 and Table 11 to guide the interrogation and assessment interview. candidate progress is based on the consistent application of the appropriate level of analysis, design, judgement and decision making for problem solving. In the early stages, there will be no measure of consistency but methodology must be sound to influence the results. The following tips and techniques, can be used to assess each outcome:

OUTCOME 1:

- Is the candidate able to define the problem in engineering terms and did he/she establish scenarios before analysing the problem?
- Does the analysis contain adequate theoretical and engineering content, at the desired level of complexity, to inform and establish parameters for designing and developing the solution?
- Ensure that the candidate has sufficient planning, conceptualisation and pre-feasibility exposure and experience to support the level that you determine.

OUTCOME 2:

- Has the candidate followed a logical approach and based his/her design on the analysis and parameters established in outcome 1?
- Is there clear evidence that the candidate applied theory, first principles, empirical knowledge and/or an engineering body of knowledge in the design of the solution?
- Ensure that the candidate is able to evaluate, draw conclusions and motivate his/her design solution.
- The candidate must have adequate formal and/or situational design exposure and experience to support the level that has been assessed.

OUTCOME 3:

- Has the candidate applied theoretical knowledge at the desired level in defining, analysing and designing the solution?
- The candidate must be able to identify the particular university subject that he/she used to solve the problem. Interrogate the candidate's understanding of first principles and subject matter and related knowledge such as financial, statutory and safety for instance.

OUTCOME 4:

Management of engineering activities is often confused with project management and oversight. It is important to check:

- Whether the candidate' management input has influenced the outcome of engineering activities e.g. planning, design, construction, operations and maintenance?
- What, or whom, the candidate took responsibility for e.g. resource management, organising, leading and controlling engineering activities.
- Ensure that the candidate's management effort is aligned to the position and/or responsibility that was assumed, and the period.

OUTCOME 5:

- The importance of communication must not be overlooked in the candidate's progress and development and must not be confused with institutional and management communication. Mentors must evaluate the communication of engineering activities and focus on the method of reporting and communication, such as business plans, scopes of work, design reports, reports to council and funding requests.
- The ability of the candidate to verbally account for work and experience and the completion of his/her TERs is a measure in itself.

OUTCOMES 6 AND 7:

- The consideration, and understanding of social, cultural, environmental, health and safety impacts is not enough for the candidate to progress. Other than meeting the requirements, the candidate must demonstrate how these factors influenced his/her problem solving, management decisions and judgement.
- The impacts must be demonstrated in the candidate's analysis and the establishment of design parameters.

- Ensure that the candidate has applied national policy and standards in the scoping of work and factored these into design criteria.

OUTCOME 8:

- The candidate's understanding and ability to recite the ECSA Code of Conduct is not enough. Engineering ethics is not only concerned with performing work that is reserved for a specific category, it is about giving the client what is needed, when it is needed, at the right price and ensuring the service or infrastructure realises its life expectancy.
- The requirements of this outcome are regularly overlooked or misinterpreted. The candidate must demonstrate instances where he/she applied the Code of Conduct in judgement and decision making.

OUTCOMES 9 AND 10:

- The progress of the candidate in judgement and responsible decision making is interdependent on the competence demonstrated in all the aforementioned outcomes. It is dependent on the candidate's ability to solve problems by consistently considering theoretical, social, cultural, legal, regulatory, environmental, health and safety impacts.
- If a candidate has not shown significant progress in outcomes 1, 2 and 3, it is virtually impossible to score them on outcomes 9 and 10.

OUTCOME 11:

- Ensure that the candidate has done IPD activities (training and research) that are relevant to engineering work he/she has done at that time. The candidate should be able to demonstrate how their knowledge has influenced specific engineering and workplace activities.

HOLISTIC ASSESSMENT:

- Mentors must do a holistic assessment at least once every six months. This is an opinion of how the candidate has progressed, specific areas and activities that need attention and training activities that need to be planned.

ECSA COMPETENCE RATINGS

The ECSA referee form calls on the mentor and others who agree that the candidate is ready for registration, to rate progress against the 11 Outcomes as well as make a holistic evaluation of performance. They are asked to use the following scale:

- CDC: The applicant consistently demonstrates competence
- CDI: The applicant has demonstrated competence but not consistently
- CNDD: The applicant has not demonstrated competence but is developing
- CND: The applicant has not demonstrated competence
- X: I am unable to comment

When assessing the outcomes, the above ratings for each outcome should be used.

FORMATIVE ASSESSMENTS

- Regular assessments, preferably at least quarterly, should take place to ensure that candidates are making progress. These assessments would review progress with the range of activities or work stages. More rigorous assessments relating to readiness for registration, which are discussed under summative assessments, should also be carried out from time to time, at least twice annually.

SUMMATIVE ASSESSMENTS

- When the candidate is ready for registration, the range of activities must be submitted for review plus detailed reports to demonstrate that all the outcomes, including the complexity and level of responsibility have been achieved.

Once the candidate has reached CDC for each outcome and has worked at responsibility level E for at least 12 months, he/she is ready for registration.

5. The Registration System

The registration system is outcomes-based system, the principles of which were described earlier.

DOCUMENTATION

All the forms to be completed are available on the ECSA website, www.ecsa.co.za. The main forms to be completed are shown in Figure 7.

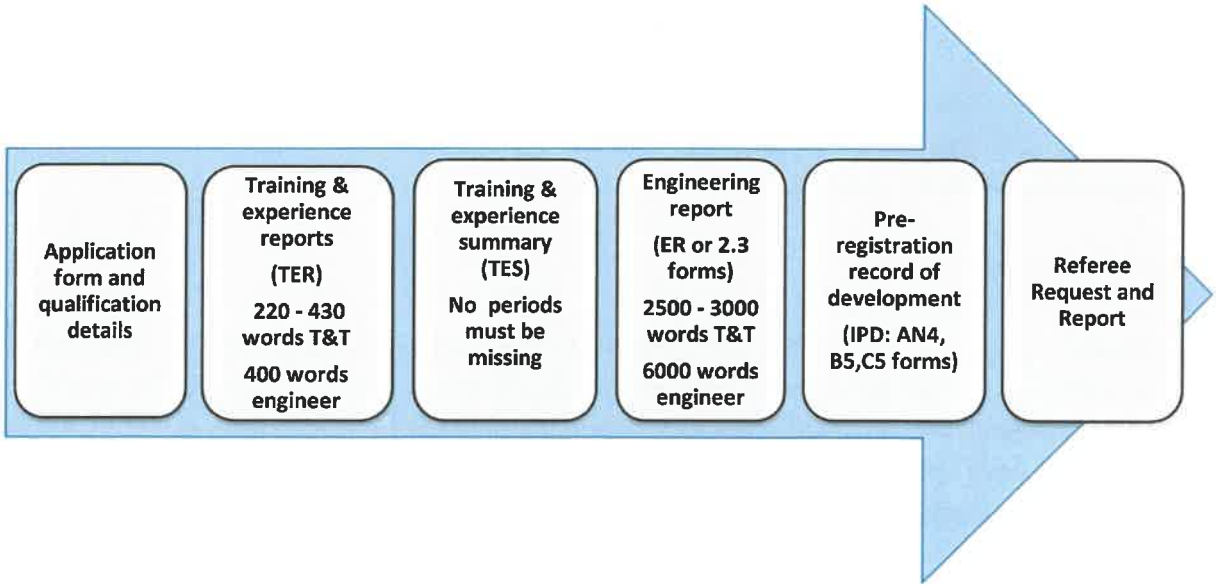

FIGURE 7: FORMS TO BE COMPLETED

The candidate should download the appropriate forms at the beginning of the training programme and develop the habit of filling them in, having them signed off, and filing them for safekeeping as required. In time, ECSA will be launching an online application system. This will allow the candidate to complete the application online, upload each signed report and when all forms are completed and uploaded, finally press the **Submit** button. It is thus essential that the candidate registers as a candidate now, so that ECSA keeps him/her informed on the progress they are making with the system development and the transition arrangements for transferring from the paper-based to the online system.

Explanatory documents are available on the ECSA website under **ECSA Documents** > **3.2.1** for Engineers, **3.3.1** for Technologists and **3.4.1** for Technicians.

Policy and standards

- **R-01-P** Registration Policy
- **R-02-PE, PT, PN** Competency Standard
- **R-03-PE, PT, PN** Application and Assessment Process

PE refers to Professional Engineer, PT refers to Professional Engineering Technologist and PN to Professional Engineering Technician.

Guidelines

- **R-04-P** Training and mentoring Guide
- **R-05-PE, PT, PN** Discipline-Specific Training Guidelines (DSTG)
- **R-08-PE, PT, PN** Guide to Competency Standards

The path to developing the required outcomes is not prescribed. The DSTGs act as a guide only, and do not prescribe specific activities or the duration for activities that must be completed before candidates can apply for registration.

Application forms

As shown in Figure 7, there are several forms and reports to complete. The first forms are for information – the candidate's name, contact details, qualifications, referee details etc. The main forms in which the candidate describes work experience and how the outcomes were achieved, are the Training and Experience Reports (or Outlines) (TERs or TEOs) and the Engineering Report (ER). Each set of forms has a different purpose, as shown in Figure 8.

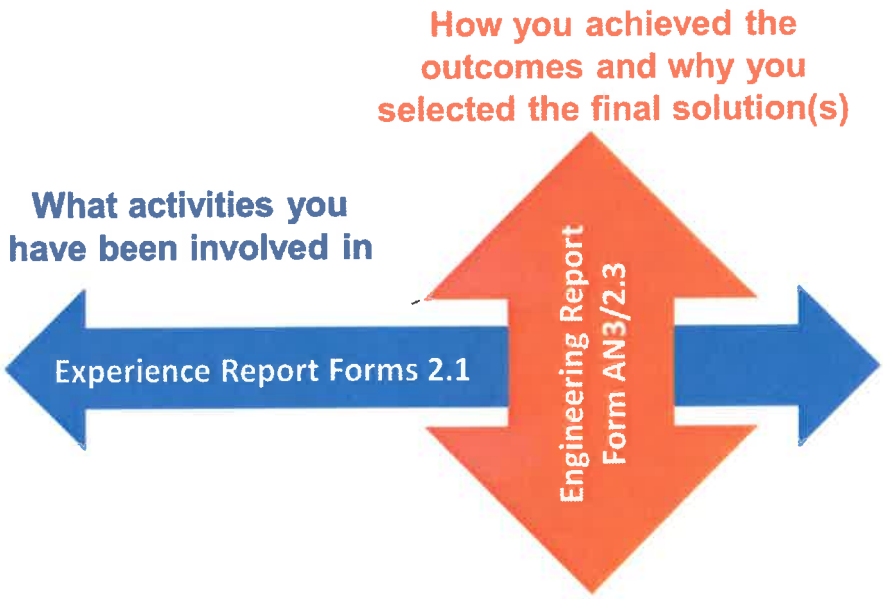

FIGURE 8: REPORTING ON THE BREADTH AND DEPTH OF TRAINING

SUMMARY OF TRAINING/EXPERIENCE REPORTS: AN2.3, B2.2, OR C2.2

After each training period, it is necessary to write a report on the experience gained, and to record the period number and the subject and type of work in these summary reports. Experience recording should start from the day work commenced after satisfying the academic requirements. A chronological list of all activities must be recorded with no gaps from the time work started.

To ensure that is a continuous record of training, these forms should be filled in at the end of each period. The forms to be filled in are as follows:

- **Form AN2.3** Engineer
- **Form B2.2** Engineering Technologist
- **Form C2.2** Engineering Technician

Ensure that progression of responsibility is described in the *'Post held'* column. Typically, the first period would reflect the position as a Trainee Engineer, Technologist or Technician, and the last period would show that the candidate is a Designer, Contracts Manager or somebody in a more senior position taking responsibility. There will be progression from one position to the next as the level of responsibility increases as the candidate moves from being exposed to participating and ultimately, performing.

Criteria for change of period

To demonstrate the range of experiences, it is important to commence a new period if:

- The type of work changes
- The work becomes more complex
- The level of responsibility changes
- The candidate changes organisation

No gaps are allowed in this summary. Periods during which no engineering work is done, must also be recorded in the summary. For instance, periods of full-time study, a gap year, extended illness, maternity leave etc. must be recorded as separate periods. Training and Experience Reports would not be written for these periods.

Training & experience summary – Engineer

Engineering Council of South Africa

(05/10/2016) **Form AN2.3**

R-03-TES-PE

SUMMARY OF TRAINING/EXPERIENCE REPORTS : PROFESSIONAL ENGINEERS

Surname and Initials: _____

Discipline of Engineering: _____
(e.g. Civil /Mech etc.)

First complete a Form AN2.1 for each period.

Period No.	Dates From:	Dates To:	No. of weeks	Employer	Post held	Subject and type of work
Total Weeks:						

Signature of Applicant: _____ **Date:** _____

Engineering Council of South-Africa

Training and Experience **Summary** **Form B2.2-TES** (17/07/2014)

Surname and Initials:

First complete a Training and Experience Report Form B2.1 TER, or a Training and Experience Outline Form B2.1 TEO for each period.

No	From	To	Weeks	Work Details		Responsibility A-E
1				Employed by:	Post held:	
				Type of Work:		
2				Employed by:	Post held:	
				Type of Work:		
n				Employed by:	Post held:	
				Type of Work:		

When an applicant is not engaged in training and experience towards registration, the period must be reflected as follows:

x				Employed by: ***Not active***	Post held:	
				Type of Work: ***Insert reason here***		
Total years, months:						

Signature of Applicant: _____ **Date:** _____

Summary of experience reports – Technician

Engineering Council of South-Africa

Training and Experience **Summary** **Form C2.2** (2014-07-17)

Surname and Initials:

First complete a Training and Experience Report Form C2.1 TER, or a Training and Experience Outline Form C2.1 TEO for each period.

No	From	To	Weeks	Work Details		Responsibility A-E
1				Employed by:	Post held:	
				Type of Work:		
2				Employed by:	Post held:	
				Type of Work:		
n				Employed by:	Post held:	
				Type of Work:		

When an applicant is not engaged in training and experience towards registration, the period must be reflected as follows:

x				Employed by: ***Not active***	Post held:	
				Type of Work: ***Insert reason here***		
Total years, months:						

Signature of Applicant: _____ **Date:** _____

TRAINING/EXPERIENCE REPORTS: AN2.1, B2.1 OR C 2.1 (TERs)

Training and Experience Reports (TERs) are very important. Each TER marks the end of a particular project or phase in experience. The candidate is required to describe the engineering experience gained and skills developed. It is essential that the role played is demonstrated, and is written in the first person singular rather than in the third person, as reviewers do not want an overview of the projects worked on, but rather wish to understand the role played, the level of responsibility assumed and strategies devised to ensure that the projects or processes were successfully executed.

The forms to be filled in are:

- **Form AN2.1** Engineer
- **Form B2.1** Engineering Technologist
- **Form C2.1** Engineering Technician

If the candidate is working on two or three different types of projects at once, he/she may refer to each in the TER to demonstrate the range of experience in the period. However, if all the projects are similar, projects may be listed, but, to save repetition, the type of experience gained should be combined into a generalised report demonstrating roles and responsibilities. Details of the client, contractor, supervisor etc. are not required, but simply the problem and how it was solved.

Engineers and technicians need not annotate outcomes when writing up TERs, but technologists are called upon to list the outcomes developed and the relevant criteria. Criteria are defined in the Engineering Report, B2.3.

Problem solving

TERs initially ask for the nature of training to be described in 20 to 30 words. This would be similar to the type of work described for the period in the TES. Thereafter, the candidate is asked to describe the nature of the problem addressed and how they went about it (method of analysis, developing solution and evaluation). Problems are not limited to what has gone wrong, but refer to anything that must be dealt with or needs a solution – e.g. the need for a new product, development, process, system, an upgrade or repair etc. This means that anything analysed can be classified as a problem and should be described in the TER. For more thoughts on problem solving, refer to the *Problem Solving* in Section 3.

Length of submission

Technicians are required to write up to 280 words per period, technologists 430 words, and engineers, approximately 400 words per period. This means that each completed TER form will be a maximum of two pages in the case of technicians and three to four pages for technologists and engineers, depending on how the activities are presented. It is suggested that the total number of words for ALL periods does not exceed 2 000 to 2 500 words. Thus, if writing 10 TERs, candidates should write less

than the 280 or 430 words in some of the reports. As shown in Figure 8, the intention of the TERs is to demonstrate the range or breadth of experience.

When writing TERs a mixture of paragraphs, bulleted lists or whatever allows the best demonstration of the range of experience for the period may be used. Candidates should try and make it as easy as possible for assessors to read the documentation.

Relevant documents

To demonstrate the scope of work and to be able to answer questions at a later stage, it is essential that the candidate keeps a record of all the important documents associated with each period. For example, research and development methodologies, detailed design parameters and calculations, the main drawings, sketches, photos, resource schedules, process diagrams, costing etc should be filed in the Development File (PoE). These will serve as a reminder to candidates of the process followed when writing up reports. Be sure that candidates review reference documents and the range of experiences before attending the interview. Remember, all engineers, technicians and technologists must attend interviews.

Organograms – demonstrating the candidate's level of authority

During each period, it is essential to show what level of authority was assumed. The candidate needs to include an organogram of the structure in which he/she was working. One or two levels above and below his//her position should be shown to demonstrate the role played. Organograms must include the names, designations per post and, where possible, the category of registration. The name of the person signing as supervisor should be visible, and above the candidate in the organogram. If he or she is working several levels above, then it will be necessary to extend the organogram to include the supervisor's level.

Supervisors

All TERs call for the name of the supervisor and his or her ECSA registration number. It is not essential that all supervisors are ECSA registered. They should, however, be adequately experienced to transfer knowledge in a particular period. As a trainee or junior, the candidate will benefit from the knowledge and direction of artisans, site staff, draughtsmen, detailers and others who have hands-on experience to share. If the supervisor is not registered, his/her qualification, and preferably year achieved, should be shown on the technician and technologist forms. As the candidate progresses, the supervisors are more likely to be senior engineering professionals registered with ECSA. The mentor and referee must, however, be registered professionals. If the supervisor is registered with an international body, he or she should include his or her registration number and the name of the organisation.

The supervisor should sign each report when the candidate has finished the period. Often delays in final submission to ECSA take place due to the fact that the supervisor has moved on, or the candidate has changed organisation and is unable to contact his or her direct supervisor for that period.

Mature candidates may have difficulty in tracing those who supervised their work years ago. If the candidate is able to contact another member of the senior team who supervised the work, and he or

she is prepared to sign on behalf of the actual supervisor at the time, this is also acceptable. If the candidate has lost track of some supervisors, an affidavit confirming that they have emigrated, left the industry or even passed away may be submitted. See a typical template at the end of this section. However, this approach may not be used for all supervisors, so contact must be made as soon as possible, to get the forms signed off! Also check on the ECSA website to see if they are still registered with ECSA.

Engineering activities

As there is a requirement to ultimately achieve the 11 outcomes set by ECSA, the candidate should not limit him/herself to describing technical work, problem-solving and decision-making. Where the candidate has been involved in the range of engineering activities described in Item 2.1.1 or 2.1.2 of the R-02 documents, such as managing resources, communicating, interacting and having to consider legislation, environmental and other issues, these activities should also be described.

Degree of responsibility

It is required that the level of responsibility for each period be classified:

- A. Being exposed
- B. Assisting
- C. Participating
- D. Contributing
- E. Performing

For full definitions see Table 2.

Recording post-graduate studies

As there should be no break in dates when submitting TERs, the candidate needs to record the time spent on full-time post-graduate studies. Although such studies expand the knowledge, thought processes and problem-solving abilities, they do not contribute towards the workplace learning and experience required for registration, as learning is not being contextualised in the workplace. A minimum of three years in the workplace over and above the post-graduate studies will still be necessary. If only coursework was completed, the period of study should be listed as an entry in the TES, but a TER would not be written. The coursework will be described in the IPD form.

If the studies included a dissertation in which an engineering solution was developed, a TER for the period, outlining how the candidate went about the research and what was proven, developed or achieved, should be written. This will demonstrate thinking and problem-solving skills. As post-graduate work tends to be individual, it will not necessarily contribute to growth as a team player or managing people. It is for this reason that the whole time away from the workplace is not necessarily counted when determining the minimum period before the candidate's registration application can be submitted. The development and application of knowledge and problem-solving skills may, however, contribute to the development of outcomes such as outcomes 1 - 3 and others such as 6 -

11. The candidate may thus use his/her research work as part of the evidence of competence against particular outcomes.

Specialisation

ECSA accommodates candidates, and especially mature candidates, who have specialised in an engineering field during their practical training to the extent that they do not comply with all the normal requirements. They may be registered on condition that they have:

- Attained knowledge in their field of engineering at least at the level of a Master's degree
- Gained a minimum of five years' experience after obtaining the Bachelor degree in engineering
- Experience of such a nature that it enables them to take engineering decisions with the necessary responsibility

Academic and research positions

The conventional approach to developing the outcomes is by working in the engineering industry. ECSA, however, recommends that those involved in academic teaching and research should be registered as professionals in order to foster the correct attitude among their students with respect to professionalism and registration. To register as professionals, academics and researchers should do some of the following practical engineering work in addition to their lecturing:

- Consulting work in which they demonstrate ability at a professional level to identify engineering problems and produce solutions which can be satisfactorily implemented. Typically, young academics may assist senior colleagues, who are professionally registered, in consulting work. Such professionals are called upon to fulfil the mentorship role and should allow the candidate to take on increasing responsibility, moving up to level E on the responsibility scale.
- Planning, design, development, commissioning of a research laboratory and/or application of research equipment or processes associated with engineering projects
- Taking responsibility for the management of workshops, laboratories and ancillary facilities
- Execution of research projects and results (preferably published), which includes the application of the essential practical training elements
- Framing and supervision of student research projects aimed at addressing or solving engineering problems
- Research and development of new curricula and/or learning materials

Since lecturers cannot be involved in the above-mentioned engineering work on a full-time basis, the minimum practical training period will normally be five years, but each application will be considered on merit. It is highly recommended that lecturers should have progressed to the level of a Master's degree.

Mature candidates

TRAINING AND EXPERIENCE OUTLINES (TEOs)

In the case of mature candidates (those with at least 10 years of training and experience after completing tertiary education), early experience will be captured in the TEO forms and later in the TER forms. It is suggested that early periods of experience be written up in bullet form, grouping the typical types of problem that were addressed in a period in each TEO. These periods could be several years and would typically change when:

- The level of responsibility changes from level B to C
- The level of responsibility changes from level D to E
- A promotion takes place
- A change of employment take place
- The nature of the work changes significantly

The lists should contain no more than 11 bullets, in the case of technicians, 13 for technologists and more for engineers. Simply list the type of work covered per period such as:

- Nature of the training or work phase or related phases
- Typical problems addressed (mandatory)
- Responsibilities for communication and documentation
- Management responsibilities
- Legal and impact analysis
- Applicant's role and responsibilities (level A - E) (mandatory)

The supervisor's signature is not required. The general declaration by the applicant covers the TEOs.

A simplified organogram in which the supervisor is identified and stating the number and level of persons supervised is required.

TRAINING AND EXPERIENCE REPORTS (TERs)

At least three years at degree-of-engineering responsibility E (Performing) should be written up in detail in the TER format and must be signed by the supervisor for each period. Such periods need not necessarily relate to the last period(s) in the applicant's TES, if the degree of responsibility of E was attained in earlier period.

Affidavits when supervisors cannot be traced

Mature candidates may struggle to find supervisors from the early part of their careers, to sign off their TERs. It is permissible to complete an Affidavit outlining why a supervisor signature has not been secured, and confirming that what is contained in the report accurately reflects the experience during that period. A typical submission format of an affidavit is suggested below.

AFFIDAVIT

To: **The Engineering Council of South Africa**

Waterview Corner, 1st Floor
2 Ernest Oppenheimer Avenue
Bruma Lake Office Park
Johannesburg 2198

Application for Professional Registration

Applicant's Full Name:	
Applicant's ID Number:	

Training /Experience Report Number:	
Employer:	
Position Held:	

I confirm that all the information provided in this Training /Experience Report is true and correct.

The reason why a supervisor's signature could not be obtained is:

- I was the owner of the business, or
- I have tried to locate and find the supervisor but without success, or
- The supervisor is deceased.

[*Delete those that are not relevant*]

Commissioner of Oaths

Signed at .....

on the ..... day of ..... 20.....

.....

Signature of Applicant

Engineering Council of South Africa (05/10/2016) **Form AN2.1**
R-03-TER-PE

TRAINING/EXPERIENCE REPORT
PROFESSIONAL ENGINEERS

Page No: ____ of___

Surname and Initials:

_____

Discipline of Engineering: _____
(e.g. Civil/Mech etc.)

Consult the enclosed Information Sheet (Sheet AN2) before completing this report.

Period No:	Date from: to:	No of weeks:	Position held:	Degree of responsibility

Employer's Name and address:	Did the candidate train under a Commitment and Undertaking (CU)? If yes, provide number of CU No:	Yes / No / No: _____
Supervisor's Name and address: ECSA Registration No:	Supervisor's Signature: Date:	

Signature of Applicant: _____ **Date:** _____

Engineering Council of South Africa (05/10/2016) **Form AN2.2**
R-03-TEO-PE

TRAINING/EXPERIENCE OUTLINE
PROFESSIONAL ENGINEERS

Page No: ____ of___

Surname and Initials:

_____

Discipline of Engineering: _____
(e.g. Civil/Mech etc.)

Consult the enclosed Information Sheet (Sheet AN2) before completing this report.

Period No:	Date from: to:	No of weeks:	Position held:	Degree of responsibility
Employer's Name and address:			Did the candidate train under a Commitment and Undertaking (CU)? If yes, provide number of CU No:	Yes / No / No: _____
Supervisor's Name and address: ECSA Registration No:			Supervisor's Signature: Date:	

Signature of Applicant: _____ **Date:** _____

Training & experience report – Technologist

This form must be used for applicants who have completed and are submitting a report for each phase of training and work experience from the time of meeting the education requirements to application for registration. Consult the Information Sheet (Sheet B2) before completing this report.

Engineering Council of South Africa

Training and Experience Report Form B2.1 TER (17/07/2014)

As part of the Application for Registration as Professional Engineering Technologist

Applicant's Name				**Applicant's Signature**		**Date:**	
Period No:	**Start date:**	**End date:**	**No of weeks:**	**Position held:**			
Employer's Name and Address for this period: (This is the employer and site at which the work took place, e.g. the site the applicant has been seconded to).				**Did the candidate train under a Commitment and Undertaking (CU)?**		**Yes** **No**	
				If yes, provide number of CU:		**No:**	
Supervisor's Name and Address: **ECSA Registration No. (If not registered, qualify):**				**Supervisor's Signature:** **Date:**			
Discipline of Engineering: (Aeronautical, Agricultural, Chemical, Civil, Electrical, Industrial, Mechanical, Metallurgical, Mining)							
Discipline Specific Field: (e.g. Power Transmission, Electronic Communication, Transportation, Structures, Automotive, Roads, etc.)							
Organogram showing supervisor (person signing this report), co-workers and those the candidate supervised (if any). Show two levels above and below, if these exist. Give names, positions, qualification and registration (if any)*. Please do not colour in blocks.							

Report: (Write in proper paragraphs in the first person singular in less than 430 words)	**Refer to Engineering Report Outcome**
Nature of training or experience (stated in 20-30 words)*	Outcomes: Criteria:
Nature of problem(s) addressed in this period; method of analysis, developing solution and evaluation (stated in 120-150 words)*	Outcomes: Criteria:
Management of materials, machines, manpower, methods or money, contracts (stated in 40-50 words)	Outcomes: Criteria:
Interaction with clients, stakeholders and other disciplines (stated in 40-50 words)	Outcomes: Criteria:
Health and safety considerations; hazards and environmental considerations; other legislation (stated in 40-50 words)*	Outcomes: Criteria:

Describe role and responsibility (in 80-100 words)*	Degree of responsibility:	Tick one only*
	A. Being exposed, under full supervision	
	B. Assisting, responsibility limited	
	C. Participating, supervision limited	
	D. Contributing, performs work, detailed approval	
	E. Performing, limited guidance	

*Mandatory fields

Training & experience outline – Mature Technologist

This form must be used for an applicant who has at least ten years training and experience after completing the educational requirement and reports a total duration of at least three years at a degree of engineering responsibility E (Performing) in detail TER format. For the remaining periods or groups of related periods the report can be in this TEO format. Consult the Information Sheet (Sheet B2) before completing this report.

Engineering Council of South Africa

Training and Experience Outline **Form B2.1 TEO** (17/07/2014)

As part of the Application for Registration as Professional Engineering Technologist

Applicant's Name				**Applicant's Signature**	**Date:**	
Period No:	**Start date:**	**End date:**	**No of weeks:**	**Position(s) held:**		
Employer's and supervisor Name and Address:				**Did the candidate train under a Commitment and Undertaking (CU)?**	**Yes** **No**	
ECSA Registration No. (If not registered, qualify):				**If yes, provide number of CU:**	**No:**	

Discipline of Engineering: (Aeronautical, Agricultural, Chemical, Civil, Electrical, Industrial, Mechanical, Metallurgical, Mining)	
Discipline Specific Field: (e.g. Power Transmission, Electronic Communication, Transportation, Structures, Automotiv Roads, etc.)	

Organogram identifying the candidate, their supervisor and persons supervised*. Please do not colour in blocks.

Outline Report: (Use bulleted form, using 10-13 bullets)	**Refer to Engineering Report Outcome**
Nature of training or experience in the period(s) stated in bullet format*	Outcomes: Criteria:
Nature of problem(s) addressed in this period; method of analysis, developing solution and evaluation (stated in bullet format)*	Outcomes: Criteria:
Management responsibilities (stated in bullet format)	Outcomes: Criteria:
Interaction with clients, stakeholders and other disciplines (stated in bullet format)	Outcomes: Criteria:
Legal and impact analysis (stated in bullet format) *	Outcomes: Criteria:

Describe role and responsibility (stated in bullet format)*	Degree of responsibility:	Tick one only*
	A. Being exposed, under full supervision	
	B. Assisting, responsibility limited	
	C. Participating, supervision limited	
	D. Contributing, performs work, detailed approval	
	E. Performing, limited guidance	

*Mandatory fields

Training & experience report – Technician

This form must be used for applicants who have completed and are submitting a report for each phase of training and work experience from the time of meeting the education requirements to application for registration. Consult the Information Sheet (Sheet C2) before completing this report.

Engineering Council of South Africa

Training and Experience Report Form C2.1-TER-PN (2014-07-17)

As part of the Application for Registration as Professional Engineering Technician

Applicant's Name				**Applicant's Signature**	**Date:**
Period No:	**Start date:**	**End date:**	**No of weeks:**	**Position held:**	
Employer's Name and Address for this period: (This is the employer and site at which the work took place, e.g. the site the applicant has been seconded to).				**Did the candidate train under a Commitment and Undertaking (CU)?**	**Yes** / **No**
				If yes, provide number of CU:	**No:**
Supervisor's Name and Address: **ECSA Registration No. (If not registered, qualify):**				**Supervisor's Signature:** **Date:**	
Discipline of Engineering: (Aeronautical, Agricultural, Chemical, Civil, Electrical, Industrial, Mechanical, Metallurgical, Mining)					
Discipline Specific Field: (e.g. Power Transmission, Electronic Communication, Transportation, Structures, Automotive, Roads, etc.)					
Organogram showing supervisor (person signing this report), co-workers and those the candidate supervised (if any). Show two levels above and below, if these exist. Give names, positions, qualification and registration (if any)*. Please do not colour in blocks.					
Report: (Write in proper paragraphs in the first person singular in less than 280 words)					
Nature of training or experience (stated in 20-30 words)*					
Nature of problem(s) addressed in this period; method of analysis, developing solution and evaluation (stated in 120- 150 words)*					
Interaction with clients, stakeholders and other disciplines (stated in 40-50 words)					
Describe role and responsibility (in 40-50 words)*				Degree of responsibility:	Tick one only*
				A. Being exposed, under full supervision	
				B. Assisting, responsibility limited	
				C. Participating, supervision limited	
				D. Contributing, performs work, detailed approval	
				E. Performing, limited guidance	

*Mandatory fields

Training & experience outline – Mature Technician

This form must be used for an applicant who has at least ten years training and experience after completing the educational requirement and reports a total duration of at least three years at a degree of engineering responsibility E (Performing) in detail TER format. For the remaining periods or groups of related periods the report can be in this TEO format. Consult the Information Sheet (Sheet C2) before completing this report.

Engineering Council of South Africa

Training and Experience Outline **Form C2.1-TEO-PN** (2014-07-17)

As part of the Application for Registration as Professional Engineering Technician

Applicant's Name				**Applicant's Signature**	**Date:**
Period No:	**Start date:**	**End date:**	**No of weeks:**	**Position(s) held:**	
Employer's and supervisor Name and Address:				**Did the candidate train under a Commitment and Undertaking (CU)?**	**Yes** / **No**
ECSA Registration No. (If not registered, qualify):				**If yes, provide number of CU:**	**No:**

Discipline of Engineering: (Aeronautical, Agricultural, Chemical, Civil, Electrical, Industrial, Mechanical, Metallurgical, Mining)	
Discipline Specific Field: (e.g. Power Transmission, Electronic Communication, Transportation, Structures, Automotive, Roads, etc.)	

Organogram identifying the candidate, their supervisor and persons supervised. Please do not colour in blocks*.

Outline Report: (Use bulleted form, using 8-11 bullets)

Nature of training or experience in the period(s) stated in bulleted format*

Nature of problem(s) addressed in this period; method of analysis, developing solution and evaluation (stated in bulleted format)*

Management responsibilities (stated in bulleted format)

Interaction with clients, stakeholders and other disciplines (stated in bulleted format)*

Describe role and responsibility (stated in bulleted format)*	Degree of responsibility:	Tick one only*
	A. Being exposed, under full supervision	
	B. Assisting, responsibility limited	
	C. Participating, supervision limited	
	D. Contributing, performs work, detailed approval	
	E. Performing, limited guidance	

*Mandatory fields

THE ENGINEERING REPORT: AN3, B2.3 OR C2.3

The most important document that the candidate will write as part of the ECSA registration process is the Engineering Report. This report should be written on projects for which full responsibility has been taken and on activities in which the candidate is involved in the workplace which will allow the candidate to demonstrate all the outcomes. The forms are as follows:

- **Engineer** Form AN3
- **Engineering Technologist** Form B2.3
- **Engineering Technician** Form C2.3

Engineers

The candidate is expected to describe how the 11 outcomes have been met. The report should touch on:

- Theoretical and practical methods used to analyse and solve engineering problems encountered
- The engineering and contextual knowledge and understanding, both from the candidate's education and acquired subsequently, required for effective performance
- The planning, organising, leading and controlling of human and other resources required to achieve the goals of the engineering work
- Handling of regulatory considerations, impacts of the work that were not necessarily covered by regulation and ethical issues, recognition of obligations to society, the profession and the environment
- Risks and uncertainty associated with the work and its product
- The recommendations, judgement calls and decisions that the candidate had to make, where leadership skills were exercised
- The nature of the responsibility the candidate carried and identification of the people to whom he/she was responsible

The report will be written in the main body of Form AN3/R-03-ER-PE. Where it is possible to use one project to demonstrate the achievement of the outcomes, it is easiest to write it in the order that the project unfolded, though this will not necessary follow the order of outcomes 1 to 11. Where the candidate finds it necessary to use several projects to demonstrate the achievement of outcomes, it may be easier to list each outcome and discuss how each outcome was achieved.

INFORMATION AND INSTRUCTIONS FOR COMPLETING ENGINEERING REPORT:

1. This is a report in which the applicant reflects on his or her engineering development and proficiency achieved as exemplified by work completed. Work completed is not necessarily in a single project.
2. Write the report in conventional prose form, using the first person singular when describing the candidate's actions or thinking.
3. Insert one heading or paragraph in each row. Do not insert boundary lines between rows.
4. Insert cross references to TERs in the text by number where appropriate. For example, "As described in TER 3, I designed a..."

5. Against relevant paragraphs, insert annotations that indicate that the material shown provides evidence of competent performance against the outcomes as defined in R-02-PE. Use the following Notation:
    a. 1, 2, 3 ... : The outcomes defined in R-02-PE demonstrated
    b. CEP : Engineering Problem referred to meets Complex Engineering Problem descriptor
    c. CEA : Engineering Activity referred to meets Complex Engineering Activity descriptor
    d. DoR x : Degree of Responsibility x = degree from A to E (See R-03-P, section 4.3)
    This is very important, and forms not complying with this, will not be assessed and will be returned to the applicant and can considerably delay the application.
6. Observe the length limits of 6 000 words maximum. Insert the word count (main column only) in the space provided. Diagrams, tables and other illustrations may be inserted in the main column but must not exceed a total more than four page heights. In the case of Mechanical applicants, they are advised that it is in their best interest to submit design calculations, limited to four pages as mentioned above. These are not included in the word count. The length limit (text and illustrations will be strictly enforced).
7. In the holistic self-evaluation block, state in 200 words or less, why the information given above demonstrates sufficient competence to be registered as a Professional Engineer.

Technicians & technologists

Forms B2.3ER and C2.3ER are broken into blocks covering the 11 outcomes. About 100 words per block should be written.

It is important to note that in the technologist report, a range of projects may be used to demonstrate how the outcomes have been achieved. If candidates plan to use more than one project, then each project should be listed in the summary blocks at the beginning of B2.3 to set the scene before the report begins. The technician report does, however, ask the candidate to use a recent engineering **task** to demonstrate how the outcomes have been achieved. If it is not possible to use only one task, then in extreme cases, additional tasks may be listed in the summary at the beginning of C2.3.

Relevant documents

With this report, relevant calculations, drawings, resource schedules, sketches, costings, photographs etc. should be submitted where necessary to demonstrate the scope of the project and the innovation introduced. Once involved in work that has been identified as being suitable for the ECSA submission, the candidate should file all such material for later consideration and possible inclusion in the submission.

The assessment process is based on A4 format, hence where it is necessary to submit a drawing or sketch to demonstrate an unusual or complex solution, the drawing should be reduced to an A4 format.

Engineering Council of South Africa (05/10/2016) **Form AN3**

R-03-ER-PE

<table>
<tr><td colspan="3">Engineering Council of South Africa
Engineering Report
as part of Application for Registration as Professional Engineer</td></tr>
<tr><td>Applicant:</td><td colspan="2"></td><td rowspan="3">Self-evaluation</td></tr>
<tr><td rowspan="2">In terms of my general declaration, I confirm that this report was written by me for the purpose of this application</td><td colspan="2">Signature:</td></tr>
<tr><td>Date:</td><td>Word Count:</td></tr>
<tr><td colspan="3"></td><td></td></tr>
<tr><td colspan="3">Holistic Self Evaluation</td><td></td></tr>
</table>

Engineering report – Technologist

Engineering Council of South Africa **Form B2.3 ER** (17/07/2014)

Engineering Report

Use this form to submit a report in about 100 words per criterion under Outcomes 1 to 11 below on recent engineering work to which the candidate have made a significant contribution. The report may cover conceptualisation, design and analysis, specification, tendering and adjudication, manufacturing, project and construction management, commissioning, maintenance, measurement and testing or planning at a broadly-defined level. Please cross-refer the item reported upon to the relevant evidence in the Training and Experience Report (B2.1 TER) or Training and Experience Outline (B2.1 TEO). Provide sample relevant calculations and drawings as an addendum.

Use Appendix A of the Discipline Specific Training Guide R-05-PT to assist in the interpretation of the criteria

Name of Applicant:

Consult the Information Sheet (Sheet B2) before completing this report.

Area of Employment: (<15 words)	
Dates Undertaken:	
Engineering brief and objective: (<30 words)	
Environment: (Industry; Laboratory; Theory; Simulation) (<15 words)	
Short Summary: (State engineering problems; solutions in < 30 words)	
Budgets: <10 words)	

Broadly-defined engineering problems *have the following characteristics:*

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

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.

Outcomes and Criteria		Cross-reference to B2.1 TER or B2.1 TEO
Outcome 1: Define, investigate and analyse broadly-defined engineering problems.		
1.1 State how the candidate performed or contributed in defining engineering problems leading to an agreed definition of the problems to be solved.		Period No:
1.2 State how the candidate performed or contributed in investigating engineering problems including collecting, organising and evaluating information.		Period No:
1.3 Describe how the candidate performed or contributed in analysing engineering problems, using conceptualisation, justified assumptions, limitations and evaluation of results.		Period No:
Outcome 2: Design or develop a solution to broadly-defined engineering problems.		
2.1 Describe how the candidate designed or developed solutions to broadly-defined engineering problems.		Period No:
2.2 Indicate how the candidate systematically synthesised solutions and alternative solutions or approaches to the problem by analysing designs against requirements, including costs and impacts on outside parameters. (requirements).		Period No:
2.3 State the candidate's part in the drawing up of detailed specification requirements and design documentation for implementation to the satisfaction of the client.		Period No:
Outcome 3: Comprehend and apply the knowledge embodied in widely accepted and applied engineering procedures and processes, systems or methodologies and those specific to the jurisdiction in which the candidate practice.		
3.1 State what engineering principles, practices, technologies, including the application of BTech theory		Period No:

the candidate apply in the candidate's practice area.		
3.2 Indicate the candidate's working knowledge of areas of practice that interact with the candidate's practice area to underpin team work.		Period No:
3.3 Describe the candidate's applied related knowledge of finance, statutory, safety and management.		Period No:
Outcome 4: Manage part or all of one or more broadly-defined engineering activities.		
4.1 State how the candidate managed the candidate'sself, people, work priorities, processes and resources in broadly-defined engineering work.		Period No:
4.2 State the candidate's role in planning, organising, leading and controlling broadly-defined engineering activities.		Period No:
4.3 State the candidate's knowledge of conditions and operation of contractors and the ability to establish and maintain professional and business relationships.		Period No:
Outcome 5: Communicate clearly with others in the course of the candidate's engineering activities		
5.1 Demonstrate the candidate's ability to write clear, concise, effective technical, legal and editorially correct reports.		Period No:
5.2 Indicate the candidate's ability to issue clear instructions to stakeholders using appropriate language and communication skills.		Period No:
5.3 State any oral presentation the candidate have made using structure, style, language, visual aids and supporting documents appropriate to the audience and purpose.		Period No:

Outcome 6: Recognise and address the reasonably foreseeable social, cultural and environmental effects of broadly-defined engineering activities.		
6.1 Describe the candidate's ability to identify interested and affected parties and their expectations in regard to interactions between technical, social, cultural and environmental considerations.		Period No:
6.2 State what measures the candidate have taken to mitigate the negative effects of engineering activities.		Period No:
Outcome 7: Meet all legal and regulatory requirements and protect the health and safety of persons in the course of his or her broadly-defined engineering activities.		
7.1 State where the candidate has identified applicable legal and regulatory requirements including health and safety requirements for the engineering activity.		Period No:
7.2 State in what circumstances the candidate has assisted in, or demonstrated awareness of the selection of save and sustainable materials, components and systems and have identified risk and applied risk management strategies.		
Outcome 8: Conduct engineering activities ethically.		
8.1 Confirm that the candidate are con-versant and operate in compliance with ECSA's Rules of Conduct for registered persons.		Period No:
8.2 State how the candidate identified ethical problems, the affected parties and select the best solution to resolve the problem.		Period No:
Outcome 9: Exercise sound judgement in the course of broadly-defined engineering activities.		
9.1 Within the application of the candidate's technologies and their interrelationship to other disciplines and technologies, state what judgement the candidate		Period No:

exercised in arriving at a conclusion.		
9.2 State what factors the candidate took into consideration bearing in mind, risk, consequences in technology application and affected parties.		Period No:
Outcome 10: Be responsible for making decisions on part or all of broadly-defined engineering activities.		
10.1 In discharging the candidate's responsibilities for significant parts of one or more activities, please state what engineering, social, environment and sustainable development the candidate took into consideration.		Period No:
10.2 State what advice the candidate sought from a responsible authority on matters outside the candidate's area of competence.		Period No:
10.3 State what academic knowledge of at least BTech level combined with past experience the candidate used in formulating the candidate's decisions.		Period No:
Outcome 11: Undertake professional development activities sufficient to maintain and extend his or her competence.		
11.1 State what strategy the candidate have independently adopted to enhance the candidate's own professional development.		Period No:
11.2 State the candidate's philosophy in regard to the candidate's professional development.		Period No:
Evidence of the candidate's competency development plan and independent learning ability must be given in the Initial Professional Development Report, Form B5.		

Signature of Applicant: _____ **Date:** _____

Signature of mentor /supervisor: _____

Name of mentor /supervisor (printed): _____ **Tel. No.:** _____

Engineering Council of South Africa (2014-07-17) **Form C2.3 ER**

Engineering Report

Use this form to report in about 100 words per criterion under Outcomes 1 to 11 below on a recent engineering task, part of a project or complete project to which the candidate have made a significant contribution. The report may cover conceptualization, design and analysis, specification, tendering and adjudication, manufacturing, project and construction management, commissioning, maintenance, measurement and testing or planning at a well-defined level. Please also provide a sample relevant calculations and drawings as an addendum which is limited to two A4 pages.

Use Appendix A of the Discipline Specific Training Guide R-05-PN to assist in the interpretation of the criteria

Name of Applicant:

Designation of Work: (<15 words)	
Date of Work:	
Engineering brief and objective: (< 30 words)	
Environment: Industry; Laboratory; Theory; Simulation, etc. in <15 words)	
Short Summary: (State engineering problems; solutions in < 30 words)	
Budget: (<10 words)	

***Well-defined engineering problems** have the following characteristics:*

a) can be solved mainly by practical engineering knowledge, underpinned by related theory;

- *and one or more of:*
- b) are largely defined but may require clarification;
- c) are discrete, focused tasks within engineering systems;
- d) are routine, frequently encountered, may be unfamiliar but in familiar context;

and one or more of:

- e) can be solved by standardised or prescribed ways;
- f) are encompassed by standards, codes and documented procedures; requires authorisation to work outside limits;
- g) information is concrete and largely complete, but requires checking and possible supplementation;
- h) involve several issues but few of these imposing conflicting constraints and a limited range of interested and affected parties;
- *and one or both of:*
- i) requires practical judgement in practice area in evaluating solutions, considering interfaces to other role-players;
- j) have consequences which are locally important but not far reaching (wider impacts are dealt with by others).

Well-defined engineering activities (WDEA) have several of the following characteristics: a) *Scope* of practice area is defined by techniques applied; change by adopting new techniques into current practice; b) Practice area is located within a wider, complex *context,* with well-defined working relationships with other parties and disciplines; c) Work involves familiar, defined range of *resources,* including people, money, equipment, materials, technologies; d) Require resolution of *interactions* manifested between specific technical factors with limited impact on wider issues; e) Are *constrained* by operational context, defined work package, time, finance, infrastructure, resources, facilities, standards and codes, applicable laws; f) Have *risks* and *consequences* that are locally important but are generally not far reaching.	
Outcomes and Criteria	
Outcome 1: Define, investigate and analyse well-defined engineering problems encountered in the candidate's work:	
1.1 State how the candidate interpreted the work instruction received, checking with the candidate's client or supervisor if the candidate's interpretation is correct.	
1.2 Describe how the candidate analysed, obtained and evaluated further clarifying information, and if the instruction was revised as a result.	
Outcome 2: Design or develop a solution to well-defined engineering problems encountered in the candidate's work:	
2.1 Describe how the candidate designed or developed and analysed alternative approaches to do the work. Impacts checked. Calculations attached.	
2.2 State what the final solution to perform the work was, client or the candidate's supervisor in agreement.	
Outcome 3: Comprehend and apply the knowledge in established engineering practices and knowledge specific within the candidate's practice area as applied in the candidate's task:	
3.1 State what NDip level engineering standard procedures and systems the candidate used to execute the work, and how NDip level theory was applied to understand and/or verify these procedures.	
3.2 Give the candidate's own NDip level theoretical calculations and/or reasoning on why the application of this theory is considered to be correct (Actual examples).	

Outcome 4: Manage part or all of one or more well-defined engineering activities embodied in the candidate's work:	
4.1 State how the candidate managed his/her priorities, processes and resources in doing the work (e.g. bar chart).	
4.2 Describe the candidate's role and contribution in the work team.	
Outcome 5: Communicate clearly with others in the course of the candidate's engineering activities (well-defined engineering work):	
5.1 State how the candidate presented the candidate's point of view and compiled reports after completion of the work.	
5.2 State how the candidate compiled and issued instructions to entities working on the same task.	
Outcome 6: Recognise the reasonably foreseeable social, cultural and environmental effects of the candidate's well-defined engineering activity (task):	
6.1 Describe the social, cultural and environmental impact of this engineering activity.	
6.2 State how the candidate communicated mitigating measures to affected parties and acquired stakeholder engagement.	
Outcome 7: Meet all legal and regulatory requirements and protect the health and safety of persons in the course of the candidate's well-defined engineering activity (task):	
7.1 List the major laws and regulations applicable to this particular activity and how health and safety matters were handled.	
7.2 State how the candidate obtained advice in doing risk management for the work and elaborate on the risk management system applied.	
Outcome 8: Conduct engineering activities ethically in executing the candidate's work:	
8.1 State how the candidate identified ethical issues and affected parties and their interest and what the candidate did about it when a problem arose.	

8.2 Confirm that the candidate are con-versant and in compliance with ECSA's Code of Conduct and why this is important in the candidate's work.	
Outcome 9: Exercise sound judgement in the course of well-defined engineering activities encountered in the candidate's work:	
9.1 State the factors applicable to the work, their interrelationship and how the candidate applied the most important factors.	
9.2 Describe how the candidate foresaw work consequences and evaluated situations in the absence of full evidence.	
Outcome 10: Be responsible for making decisions on part or all of well-defined engineering activities included in the candidate's work:	
10.1 Show how the candidate used NDip theoretical calculations to justify decisions taken in doing engineering work. Attach actual calculations	
10.2 State how the candidate took responsible advice on any matter falling outside the candidate's own education and experience.	
10.3 Describe how the candidate took responsibility for the candidate's own work and evaluated any shortcoming in the candidate's output.	
Outcome 11: Undertake professional development activities sufficient to maintain and extend the candidate's competence.	
11.1 State what strategy the candidate have independently adopted to enhance the candidate's own professional development.	
11.2 State the philosophy of the candidate's employer in regard to the candidate's professional development.	
Evidence of the candidate's competency development plan and independent learning ability must be given in the Initial Professional Development Report, Form C5 IPD	

Signature of Applicant: _____ **Date:** _____

Signature of mentor /supervisor: _____

Name of mentor/Supervisor printed: _____ **Tel. No.:** _____

PRE-REGISTRATION/INITIAL PROFESSIONAL DEVELOPMENT REPORT: AN4, B5 OR C5

There is a requirement that the candidate keeps up to date with all technology, legislation and other changes in the industry that affect the work being done. It is therefore expected that the candidate attends courses, conferences, workshops and organised site visits, and engages in self-study and investigations to ensure that he/she keeps up to date. All attendance certificates for courses and assignments should be filed.

The courses attended should be selected to enhance the candidate's ability in the field in which work is being done, and should not be random courses, attended for the sake of completing these forms. Typically, technical courses; software training on the use of technical applications or relevant Microsoft Office and other products; and business- and management-related courses should be considered. Courses will need to be classified as **engineering**, **management** or **computer** courses when completing the details in the following forms.

Post-graduate coursework would also be filled in on these forms, and if any courses for which the candidate had to write exams were attended, the results should also be included. They should mention any papers developed and delivered.

If, when doing post-graduate studies, the candidate took part in any engineering research, solved engineering problems and developed a thesis, this should be written up in a TER. If the research topic was not of an engineering nature, mention of this work should only be included in this section and not in a TER.

The forms to be filled in are as follows:

- **Engineer** Form AN4
- **Engineering Technologist** Form B5
- **Engineering Technician** Form C5

Engineering Council of South Africa (05/10/2016) **Form AN4**
R-03-IPD-PE

Pre-registration CPD-type Activity Report (IPD)

Applicant's Name:

Date(s) attended*	Provider*:	Name of Course*	Hours*:	Validating body
Venue*:	Lead presenter*:	Type*:	Points	Validation No:
Date(s) attended*	Provider*:	Name of Course*	Hours*:	Validating body
Venue*:	Lead presenter*:	Type*:	Points	Validation No:
Date(s) attended*	Provider*:	Name of Course*	Hours*:	Validating body
Venue*:	Lead presenter*:	Type*:	Points	Validation No:
Date(s) attended*	Provider*:	Name of Course*	Hours*:	Validating body
Venue*:	Lead presenter*:	Type*:	Points	Validation No:

* Compulsory field

Engineering Council of South Africa **Form B5-IPD** (17/07/2014)

INITIAL PROFESSIONAL DEVELOPMENT REPORT (IPD)

As part of the Application for Registration as a Professional Engineering Technologist

Name:

Discipline:

Itemise courses, workshops, conferences, symposia or congresses attended.
List these under the separate headings of engineering, management and computer courses.

Name or subject of item	*Course Provider*	*Dates attended*	SAQA NQF level if available	Duration in hours	Credits	For use of Assessor
Engineering Courses						
Management Courses						
Computer Courses						

Signature of Applicant **Date**

Engineering Council of South Africa (2014-07-17) **Form C5 IPD**

INITIAL PROFESSIONAL DEVELOPMENT REPORT (IPD)

As part of the Application for Registration as a Professional Engineering Technician

Name:

Discipline:

Itemise courses, workshops, conferences, symposia or congresses attended.
List these under the separate headings of engineering, management and computer courses.

Name or subject of item	*Course Provider*	*Dates attended*	SAQA NQF level if available	Duration in hours	Credits	For use of Assessor
Engineering Courses						
Management Courses						
Computer Courses						

Signature of Applicant **Date**

6. The Final Submission & Interview

THE FINAL SUBMISSION

Having completed the forms, all that remains is to:

- Have the forms signed by a Commissioner of Oaths
- Ask experienced professionals with whom the candidate has worked to act as referees
- Submit application forms
- Make payment for the registration process
- Attend an interview
- Wait for news from ECSA!

Referee reports

Referee reports are confidential and are intended to convey the personal knowledge the referee or employer has of the candidate, providing a reasoned evaluation of their capabilities.

It is expected that the referees understand the ECSA requirements well and are confident of what has been submitted. Candidates should send copies of policies and standards R-01, R-02 and R-04 relevant to their category of registration to prospective referees. To satisfy themselves on the candidate's claim to registerability, the referee should be supplied with a completed copy of the application.

It is important that referees provide ECSA with an impartial professional assessment of the candidate's readiness for professional registration and for this reason, referee reports are confidential, and must be sent directly to ECSA by the referees. The applicant is, however, responsible for ensuring that the reports are sent by the referees and received by ECSA not long after his or her application has been submitted.

To ensure that referee reports are completed and submitted timeously, the candidate could arrange for a courier to collect the completed forms from referees for delivery to ECSA, or could arrange to collect them in sealed envelopes from referees and submit them at the same time as submitting their applications. In this way, there will be no delay at ECSA in starting to process the application.

Who can be appointed as a referee?

ENGINEERS

- **At least two** referee reports are required, of which at least one must be a South African-registered Pr Eng and the other one preferably also a Pr Eng or registered in one of the three other categories.
- As it is recommended that candidates select referees who are currently acquainted with their performance, the most recent supervisor would be appropriate as a referee

TECHNOLOGISTS

- **Three** referee reports are required, of which at least one referee must be registered as either a Pr Eng or Pr Tech Eng; in exceptional cases, a Pr Cert Eng or a Pr Techni Eng may also be acceptable. At least one should be a direct supervisor. If no supervisors are registered with ECSA, a fourth registered referee must be provided
- Sheet B1.2, par.6 states that each applicant must supply ECSA with the names and addresses of three referees who have personal knowledge of the applicant's work.

TECHNICIANS

- **Three** referee reports are required. Referees in this category must be registered in one of the four professional categories provided for in the Act
- Sheet C1.2 par. 6 states that each application must supply ECSA with the names and addresses of a minimum of two but preferably three referees who have personal knowledge of the applicant's work. Referees must be registered with ECSA as a Pr Techni Eng, or a Pr Tech Eng, a Pr Cert Eng or a Pr Eng, of which one should be a direct supervisor

THE ECSA ASSESSMENT PROCESS

Once all documents have been received, i.e. the application, payment and referee forms, they are copied and distributed to reviewers to assess the application. A lengthy process then follows, including an experience appraisal, followed by the professional review.

Experience Appraisal (EA)

The EA is an assessment to determine whether the candidate has achieved the required level of competence and acquired the professional attributes specified in the DSTG for the engineering discipline concerned, in order to declare whether he/she is suitable for the Professional Review (PR).

The EA must be conducted by not less than four assessors and they must: be registered in an appropriate category; have contextual knowledge in the area of the applicant's offered evidence; and be skilled in the method of competency-based assessment to the satisfaction of the registration committee.

Professional Review (PR)

The PR is a comprehensive review of the candidate's engineering career in the form of an interview, the purpose being to assess the quality of professional attributes and the level of competence achieved during the period of training. Candidates are required to demonstrate that they have:

- Acquired an understanding of the professional environment in which they work, (including moral and ethical issues)
- Developed the ability to:
  - exercise engineering judgement
  - make responsible decisions
  - communicate lucidly and accurately
  - identify and find solutions to problems
  - implement these solutions
- Achieved an acceptable level of technical knowledge and understanding in defined training objectives within their discipline of engineering

The PR is undertaken by three reviewers.

national treasury

Department:
National Treasury
REPUBLIC OF SOUTH AFRICA

SUGGESTED STATUTORY COUNCIL REPORTING TEMPLATES FOR THE ISDG PROGRAMME

July 2016

Table of Contents

REQUIREMENTS FOR A CANDIDACY PROGRAMME

In designing and reviewing a programme such as that embarked upon by National Treasury, it is important to realise that there are many variables which must be managed to ensure success. In essence, the elements of training towards professional registration include:

1. Adherence to Statutory Council guidelines
2. Selection of qualifying candidates
3. Comprehensive induction
4. Registration as a candidate
5. An adequate workplace environment
6. Comprehensive on-the-job training and experience
7. Supervision and coaching, generally provided by the line-manager
8. Long-term mentoring
9. Supplementary training to enhance technical and soft skills
10. Reporting, reviewing and assessing progress in the workplace and towards registration
11. Adequate preparation for the registration review, assessment and/or exam
12. Management commitment

In this programme, several of the above items are already in place. However, one of the weaknesses identified has been the limited number of Statutory Council (SC) reports that have been written up. Leaving these to the end, when the candidate is ready for registration, will mean that the submission could be delayed by several months, as it takes time to write up the material and gather signatures from past supervisors or mentors, as required.

The following pages outline the suggested or required activities which must be included in the training plan and the templates which should be completed on an ongoing basis so that candidates build up evidence for registration. Candidates should download the latest form from the SC website.

STATUTORY COUNCIL ACTIVITIES AND ASSESSMENTS

ECSA – all categories of registration

TYPICAL ENGINEERING ACTIVITIES TO BE INCLUDED IN A TRAINING PLAN
(See R-02-P series, clause 7.3.3 of R-04-P and Discipline-specific Training Guidelines)
Minimum of THREE years of workplace experience, 52 weeks of which must be at degree of responsibility E

- Investigation and problem resolution
- Conceptualisation
- Planning
- Design
- Improvement of materials, components, systems or processes
- Documentation/procurement
- Implementation, manufacture or construction
- Commissioning, testing, withdrawal
- Engineering operations
- Maintenance
- Engineering Project management
- Research, development and commercialisation
- Engineering Management
- Finance

REPORTING FORMAT TO BE USED

- Engineer – Training and Experience Report A(N)2.1
- Engineering Technologist – Training and Experience Report B2.1
- Certificated Engineer– Training and Experience Report CE 2.1
- Engineering Technician – Training and Experience Report C2.1

To be written up as drafts quarterly and signed off by the Supervisor when the period is complete

FORMATIVE ASSESSMENTS – OUTCOMES TO BE ASSESSED
(Six monthly or annually depending on the requirements of the candidacy phase programme)

1. Define, investigate, analyse engineering problems
2. Design or develop solutions to engineering problems
3. Comprehend and apply advanced knowledge
4. Manage part or all of an engineering activity
5. Communicate clearly
6. Recognise and address social, cultural, environmental effects
7. Meet legal and regulatory requirements
8. Behave ethically
9. Exercise sound judgement
10. Take responsibility for decision making
11. Undertake professional development

RATING

CDC: The applicant consistently demonstrates competence

CDI: The applicant has demonstrated competence but not consistently

CNDD: The applicant has not demonstrated competence but is developing

CND: The applicant has not demonstrated competence

Level descriptor: Pr Eng – complex work, Pr Tech Eng and Pr Cert Eng – broadly defined, Pr Techni Eng – well-defined

SUMMATIVE ASSESSMENT (FINAL SUBMISSION)

When the Candidate is ready for registration the following forms should be completed and submitted to ECSA, along with the application fees:

- Application form
- Certified copy of ID
- Certification copy of engineering qualification
- Training and experience reports (or Outlines where relevant)
- Engineering Report
- Initial Professional Development Form
- Referee Reports

INTERVIEWS

- All engineers are required to attend professional interviews
- Other categories of registration may be invited to interviews at the Registering Committee's discretion

SAGC – GIS Technician

TYPICAL GISc ACTIVITIES TO BE INCLUDED IN TRAINING PLAN

The period of WIL is a minimum of 220 working days, with minimum days per activity shown below. All experience must be obtained after the date of completion of the requirements for the qualification.

Compulsory training (80 days)

i. IT Skills – 10
ii. Data collection and capture – 15
iii. Data manipulation – 15
iv. Reproduction procedures – 5
v. Spatial modelling – 20
vi. Map production – 15

Additional training (140 days)

a) IT Skills development
b) Data collection, capture and processing
c) Data manipulation
d) Spatial Modelling
e) Photogrammetric compilation
f) Image processing
g) Map production

Notes:
Not less than 140 working days, of which not less than 10 days or more than 100 days in any one category can be included in the report. Work in at least three additional categories must be included.

REPORTING FORMAT TO BE USED

Work Integrated Learning (WIL) Schedule

This schedule must be compiled in chronological order, as an extract from diary entries. When complete, each page must be signed by the Mentor (with whom the Candidate has trained) and the Candidate. WIL should include planning, specification writing, interviews with the client, writing proposals, analysis of results and writing the final report for the client. Personnel management, logistics and financial management may also be included. The number of working days includes office and field work, of which not more than 10% may be field work. The use of modern technology is essential and the Candidate must be proficient with this technology.

FORMATIVE ASSESSMENTS – ACTIVITIES TO BE ASSESSED

Each GISc activity must be assessed to determine whether the minimum duration has been achieved, and the Mentor must rate competency achieved in each element during an oral examination, considering the level of responsibility and the level of complexity to determine whether the Candidate has reached the desired level of competence in that activity, or whether further experience is required.

SUMMATIVE ASSESSMENT (FINAL SUBMISSION)

When the Candidate is ready for registration the following forms should be completed and submitted by the applicant to the Council, along with the application fees:

- Application form
- WIL Schedule
- Certified copy of GISc qualification as well as transcript of courses completed if non-accredited qualification
- Certificate of Employment per employer with whom the Candidate has served during the training period.

Law exam

Law exam A must be written after completion of the WIL in addition to submitting the application for registration.

Interview

Where required the assessor may arrange a telephonic or face-to-face interview with the Candidate

Additional training

Should the Council be of the opinion that the learning is inadequate or does not cover a wide scope of work, it may require the Candidate to undergo further training. The practical tests if deemed necessary could consist of one or more tasks. A Candidate should not normally need more than three weeks to complete the practical test.

SAGC – GIS Technologist

TYPICAL GISc ACTIVITIES TO BE INCLUDED IN TRAINING PLAN

The period of WIL is a minimum of 220 working days, with minimum days per activity shown below. All experience must be obtained after the date of completion of the requirements for the qualification.

Compulsory training (120 days)

i. Data collection and capture – 20
ii. Data manipulation – 15
iii. Reproduction procedures – 5
iv. Database and spatial modelling – 15
v. Map production – 20
vi. Spatial statistics and interpolation – 5
vii. Spatial analysis – 10
viii. Remote sensing and photogrammetry – 10
ix. Project management – 20

Additional training (100 days)

a) Data collection, capture and processing
b) Spatial Data Modelling
c) Spatial Information management, manipulation and recovery
d) Spatial data quality assessment and error management
e) Spatial Statistics and Analysis
f) Project management
g) Remote sensing and Image Processing

Notes :

Not less than 100 working days, of which not less than 10 days or more than 40 days in any one category can be included in the report. Work in at least three additional categories must be included.

REPORTING FORMAT TO BE USED

Work Integrated Learning (WIL) Schedule

This schedule must be compiled in chronological order, as an extract from diary entries. When complete, each page must be signed by the Mentor (with whom the Candidate has trained) and the Candidate. WIL should include planning, specification writing, interviews with the client, writing proposals, analysis of results, and writing the final report for the client. Personnel management, logistics and financial management may also be included. The number of working days includes office and field work, of which not more than 10% may be field work. The use of modern technology is essential and the Candidate must be proficient with this technology.

FORMATIVE ASSESSMENTS – ACTIVITIES TO BE ASSESSED

Each GISc activity must be assessed to determine whether the minimum duration has been achieved, and the Mentor must rate competency achieved in each element during an oral examination, considering the level of responsibility and the level of complexity to determine whether the Candidate has reached the desired level of competence in that activity, or whether further experience is required.

SUMMATIVE ASSESSMENT (FINAL SUBMISSION)

When the Candidate is ready for registration the following forms should be completed and submitted by the applicant to the Council, along with the application fees:

- Application form
- WIL Schedule
- Certified copy of GISc qualification as well as transcript of courses completed if non-accredited qualification
- Certificate of Employment per employer with whom the Candidate has served during the training period.

Law exam

Law exams A and F must be written after completion of the WIL in addition to submitting the application for registration.

Interviews

An interview may be conducted to clarify aspects of the work and other submissions. Where required the assessor may arrange a telephonic or face-to-face interview with the Candidate

Additional training

Should the Council decide that the learning is inadequate or does not cover a wide enough scope, it may require the Candidate to undergo further training. Practical tests could consist of one or more tasks. A Candidate should not normally need more than three weeks to complete the practical test.

SAGC – Professional GIS Practitioner

TYPICAL GISc ACTIVITIES TO BE INCLUDED IN TRAINING PLAN

The period of WIL is a minimum of 220 working days, with minimum days per activity shown below. All experience must be obtained after completion of the requirements for the qualification.

Compulsory training (120 days)

i. Data collection and capture – 20
ii. Data manipulation – 15
iii. Reproduction procedures – 5
iv. Database and spatial modelling – 15
v. Map production – 20
vi. Spatial statistics and interpolation – 5
vii. Spatial analysis – 10
viii. Remote sensing and photogrammetry – 10
ix. Project management – 20

Additional training (100 days)

a) Data collection, capture and processing
b) Spatial Data Manipulation
c) Map Production
d) Databases and Spatial Data Modelling
e) Spatial Statistics, Interpolation and Analysis
f) Project management
g) Remote sensing and Image Processing
h) Spatial information management, manipulation and recovery
i) Spatial data quality assessment and error management

Notes:
Not less than 100 working days, of which not less than 10 days or more than 40 days in any one category can be included in the report. Work in at least three additional categories must be included.

REPORTING FORMAT TO BE USED

Work Integrated Learning (WIL) Schedule

This schedule must be compiled in chronological order, as an extract from diary entries. When complete, each page must be signed by the Mentor (with whom the Candidate has trained) and the Candidate. WIL should include planning, specification writing, interviews with the client, writing proposals, analysis of results, and writing the final report for the client. Personnel management, logistics and financial management may also be included. The number of working days includes office and field work, of which not more than 10% may be field work. The use of modern technology is essential and the Candidate must be proficient with this technology

FORMATIVE ASSESSMENTS – ACTIVITIES TO BE ASSESSED

Each GISc activity must be assessed to determine whether the minimum duration has been achieved, and the Mentor must rate competency achieved in each element during an oral examination, considering the level of responsibility and the level of complexity to determine whether the Candidate has reached the desired level of competence in that activity, or whether further experience is required.

SUMMATIVE ASSESSMENT (FINAL SUBMISSION)

When the Candidate is ready for registration the following forms should be completed and submitted by the applicant to the SAGC, along with the application fees:

- Application form
- WIL Schedule
- Certified copy of GISc qualification and transcript of courses completed if a non-accredited qualification
- Certificate of Employment per employer with whom the Candidate has served during the training period.

Essay

All applicants are required to write an essay of approximately 1500 words on professionalism and ethics with special reference to the registration and practice of GISc in South Africa. The essay should include a discussion of South African requirements and the laws and organisations responsible.

Law exam

Law exams A and F must be written after completion of the WIL.

Interview

An interview may be conducted to clarify aspects of the essay and other submissions. This may be a telephonic or face-to-face interview with the Candidate

Additional training

Should the Council be of the opinion that the learning is inadequate or does not cover a wide scope of work, it may require the Candidate to undergo further training. The practical tests if deemed necessary could consist of one or more tasks. A Candidate should not normally need more than three weeks to complete the practical test.

SACPCMP – Construction Professions

TYPICAL CONSTRUCTION PROJECT MANAGEMENT WORK STAGES TO BE INCLUDED IN TRAINING PLAN
Minimum of THREE years of workplace experience after qualifying as a Candidate with an Honours degree or BTech and four years with other qualifications. Percentage of time allocation is shown under each occupation

WORK STAGES	Construction Project Manager	Construction Manager
1. Project Initiation and Briefing	20%	10%
2. Concept and Feasibility	20%	25%
3. Design development – including Scope, Time, Cost, Quality, Communication, Risk	40%	20%
4. Tender Documentation and Procurement – including Communication, Cost, Risk	10%	10%
5. Construction Documentation and Management	5%	30%
6. Project Close Out	5%	5%

REPORTING FORMAT TO BE USED

- Log Book and Project Reports (form A1)

To be written up as drafts quarterly, signed off per activity and submitted to SACPCMP annually.

FORMATIVE ASSESSMENTS – OUTCOMES TO BE ASSESSED

Log books and project reports to be submitted to SACPCMP annually to be assessed, to ensure that progress is being made. Mentors should carry out interim assessments in a similar fashion.

WORK STAGES

1. Project Initiation and Briefing
2. Concept and Feasibility
3. Design development – including Scope, Time, Cost, Quality, Communication, Risk
4. Tender Documentation and Procurement – including Communication, Cost, Risk
5. Construction Documentation and Management
6. Project Close Out

RATING

- Achieved
- Partially achieved
- Not achieved

the latter two, plan more work.

SUMMATIVE ASSESSMENT (FINAL SUBMISSION)

When the Candidate is ready for registration the following forms should be completed and submitted to the SACPCMP, along with the application fees:

- Application form
- Recently certified copy of ID
- Certified copy of qualification
- Logbook

- Form A1
- Form A2
- CV in prescribed format

EXAM

Applicants with non-accredited qualifications will need to pass the Council Examination

INTERVIEW

All applicants are expected to pass a professional interview (PI).

SACPLAN – Town Planning

TYPICAL PLANNING ACTIVITIES TO BE INCLUDED IN TRAINING PLAN **Minimum of 24 months of ACTUAL TIME workplace experience, with at least 6 months per category**	
Category A	**Category B**
1. National Spatial Plans (Strategic Planning at National Level) 2. Regional Spatial Plans 3. Sub-Regional Spatial Plans 4. Urban Spatial Plans 5. Local Spatial Plans 6. Planning Surveys, Analyses and/or Policy Formulation 7. Layout Plans, Township Plans and Land Development Plans 8. Urban Design and Site Planning 9. Planning Research 10. Academic Work 11. Development Evaluation 12. Land Economics 13. Corporate Strategic Planning 14. Miscellaneous Planning Work 15. Other	16. Urbanisation 17. Housing 18. Development Planning 19. Statutory Town Planning and Zoning Schemes 20. Development Control & Appeals 21. Consent Use i.t.o. Statutory Requirements (including amendments to Title Restrictions) 22. Project Management 23. Development Coordination 24. Planning Law 25. Plan Evaluation 26. Transportation and Land Use Planning 27. Property Development 28. Integrated Environmental Management 29. Rural Development 30. Negotiation and Mediation 31. Other

REPORTING FORMAT TO BE USED
Practical Training Report – form A2 To be written up as a draft quarterly and signed off per activity

FORMATIVE ASSESSMENTS – OUTCOMES TO BE ASSESSED	
▪ Scope of knowledge ▪ Knowledge literacy ▪ Method and procedure ▪ Problem solving ▪ Ethics and professional practice	▪ Accessing, processing and managing information ▪ Producing and communicating of information ▪ Context and systems ▪ Management of learning ▪ Accountability

SUMMATIVE ASSESSMENT (FINAL SUBMISSION)	
When the Candidate is ready for registration the following forms should be completed and submitted to SACPLAN, along with the application fees: ▪ Application form ▪ Section 13(7) Declaration ▪ Schedule of personal details ▪ Certified copy of Identity Document ▪ Certified copy of Qualification	▪ Summary of Practical Training Report (Form A1) ▪ Completed Practical Training Report (Form A2) ▪ Sworn Affidavit by Supervisor(s) (Form A3) Note: SACPLAN is in the process of developing more advanced registration requirements that may include a written examination after the practical experience period

SACQSP – Quantity Surveying

TYPICAL QUANTITY SURVEYING AREAS OF SKILL TO BE INCLUDED IN TRAINING PLAN **Minimum of 5700 hours of workplace experience. Percentage of time allocation is shown under each area.**		
1. Inception	5%	This could be in: ▪ Architectural quantity surveying, or ▪ Engineering quantity surveying covering activities in at least two of civil, electrical or mechanical engineering If Candidates are unable to obtain sufficient experience in a particular skills category, performing previously-completed tasks within their offices offers an acceptable alternative
2. Concept and feasibility	10%	
3. Design development	15%	
4. Documentation and procurement	20%	
5. Construction	35%	
6. Close out	10%	
7. Specialisation	5%	

REPORTING FORMAT TO BE USED

The daily diary must be completed online from which the Activity Summary (previously known as the logbook) will be generated. In addition, project details must be completed on an ongoing basis. The Supervisor must sign off acknowledgement of the work having been performed before it will be registered in the system.

FORMATIVE ASSESSMENTS – OUTCOMES TO BE ASSESSED

On funded Mentorship programmes, the Candidate should print out the Activity Summary and Summary of Projects for every Mentor meeting and the Mentor should assess progress against Activities 1 to 7. The workplace training period in hours against the total required should be considered and preliminary reports should be rated as: Excellent 6, Good 4, Fair 2, Poor 0 when considering:

- Diversity of projects
- Diversity of responsibility
- Progression of responsibility
- Sufficient detail / depth
- Personal involvement
- Best practice ability
- Language and presentation

The SACQSP will review progress after 18 months and will advise on any short-comings

SUMMATIVE ASSESSMENT (FINAL SUBMISSION)

When the Candidate is ready for registration the prescribed Professional Skills Modules must have been completed. The following paperwork should be submitted to the SACQSP, along with the application fees:

- Application form
- Certified copy of ID
- Certified copy of QS qualification
- Activity Summary Report (Extracted from QS DIARY)
- Project Summary Report (Extracted from QS DIARY)
- A 2500 word Project Specific Report
- Certificate of Compliance of supplementary education (Council Exams or PSM)
- Candidate declaration

APC INTERVIEW

Once the above have been assessed as acceptable by the SACQSP, the Candidate will be invited to attend an Assessment of Professional Competence (APC) interview. In addition to the above the Candidate must submit a one page CV prior to the interview

STATUTORY COUNCIL REPORTING TEMPLATES

The following pages contain Statutory Council reports which should be used for reporting progress and to build up a portfolio of evidence for eventual submission to the respective council.

ECSA – TER, TES and IPD Schedules

Engineering Council of South Africa (05/10/2016) **Form AN2.1**

R-03-TER-PE

TRAINING/EXPERIENCE REPORT
PROFESSIONAL ENGINEERS

Page No: ____ of___

Surname and Initials: _____

Discipline of Engineering: _____
(e.g. Civil/Mech etc.)

Consult the enclosed Information Sheet (Sheet AN2) before completing this report.

Period No:	**Date from:** **to:**	**No of weeks:**	**Position held:**	**Degree of responsibility**
Employer's Name and address:			**Did you train under a Commitment and Undertaking (CU)? If yes, provide number of CU No:**	**Yes** **No** **No:**
Supervisor's Name and address: **ECSA Registration No:**			**Supervisor's Signature:** **Date:**	

Signature of Applicant: _____ **Date:** _____

SUMMARY OF TRAINING/EXPERIENCE REPORTS : PROFESSIONAL ENGINEERS

Surname and Initials: _____

Discipline of Engineering: _____
(e.g. Civil / Mech etc.)

First complete a Form AN2.1 for each period.

Period No.	Dates From:	To:	No. of weeks	Employer	Post held	Subject and type of work
Total Weeks:						

Signature of Applicant: _____ **Date:** _____

This form must be used for applicants who have completed and are submitting a report for each phase of training and work experience from the time of meeting the education requirements to application for registration. Consult the Information Sheet (Sheet B2) before completing this report.

Engineering Council of South Africa

Training and Experience Report **Form B2.1 TER** (17/07/2014)

As part of the Application for Registration as Professional Engineering Technologist

Applicant's Name				**Applicant's Signature**		**Date:**	
Period No:	**Start date:**	**End date:**	**No of weeks:**	**Position held:**			
Employer's Name and Address for this period: (This is the employer and site at which the work took place, e.g. the site the applicant has been seconded to).				**Did you train under a Commitment and Undertaking (CU)?**		**Yes** **No**	
				If yes, provide number of CU:		**No:**	
Supervisor's Name and Address: **ECSA Registration No. (If not registered, qualify):**				**Supervisor's Signature:** **Date:**			
Discipline of Engineering: (Aeronautical, Agricultural, Chemical, Civil, Electrical, Industrial, Mechanical, Metallurgical, Mining)							
Discipline Specific Field: (e.g. Power Transmission, Electronic Communication, Transportation, Structures, Automotive Roads, etc.)							
Organogram showing Supervisor (person signing this report), co-workers and those you supervised (if any). Show two levels above and below, if these exist. Give names, positions, qualification and registration (if any)*. Please do not colour in blocks.							

Report: (Write in proper paragraphs in the first person singular in less than 430 words)		**Refer to Engineering Report Outcome**
Nature of training or experience (stated in 20-30 words)*		Outcomes: Criteria:
Nature of problem(s) addressed in this period; method of analysis, developing solution and evaluation (stated in 120-150 words)*		Outcomes: Criteria:
Management of materials, machines, manpower, methods or money, contracts (stated in 40-50 words)		Outcomes: Criteria:
Interaction with clients, stakeholders and other disciplines (stated in 40-50 words)		Outcomes: Criteria:
Health and safety considerations; hazards and environmental considerations; other legislation (stated in 40-50 words)*		Outcomes: Criteria:
Describe role and responsibility (in 80-100 words)*	Degree of responsibility:	Tick one only*
	A. Being exposed, under full supervision	
	B. Assisting, responsibility limited	
	C. Participating, supervision limited	
	D. Contributing, performs work, detailed approval	
	E. Performing, limited guidance	

*Mandatory fields

Engineering Council of South-Africa

Training and Experience Summary

Form B2.2-TES (17/07/2014)

Surname and Initials:

First complete a Training and Experience Report Form B2.1 TER, or a Training and Experience Outline Form B2.1 TEO for each period.

No	From	To	Weeks	Work Details		Responsibility A-E
1				Employed by:	Post held:	
				Type of Work:		
2				Employed by:	Post held:	
				Type of Work:		
3				Employed by:	Post held:	
				Type of Work:		
4				Employed by:	Post held:	
				Type of Work:		
5				Employed by:	Post held:	
				Type of Work:		
6				Employed by:	Post held:	
				Type of Work:		
7				Employed by:	Post held:	
				Type of Work:		
8				Employed by:	Post held:	
				Type of Work:		
9				Employed by:	Post held:	
				Type of Work:		
n				Employed by:	Post held:	
				Type of Work:		

When an applicant is not engaged in training and experience towards registration, the period must be reflected as follows:

x				Employed by: ***Not active***	Post held:	
				Type of Work: ***Insert reason here***		
	Total years, months:					

Signature of Applicant: _____ **Date:** _____

This form must be used for applicants who have completed and are submitting a report for each phase of training and work experience from the time of meeting the education requirements to application for registration. Consult the Information Sheet (Sheet C2) before completing this report.

Engineering Council of South Africa

Training and Experience Report **Form C2.1-TER-PN** (2014-07-17)

As part of the Application for Registration as Professional Engineering Technician

Applicant's Name				**Applicant's Signature**		**Date:**	
Period No:	**Start date:**	**End date:**	**No of weeks:**	**Position held:**			
Employer's Name and Address for this period: (This is the employer and site at which the work took place, e.g. the site the applicant has been seconded to).				**Did you train under a Commitment and Undertaking (CU)?**		**Yes** **No**	
				If yes, provide number of CU:		**No:**	
Supervisor's Name and Address: **ECSA Registration No. (If not registered, qualify):**				**Supervisor's Signature:** **Date:**			
Discipline of Engineering: (Aeronautical, Agricultural, Chemical, Civil, Electrical, Industrial, Mechanical, Metallurgical, Mining)							
Discipline Specific Field: (e.g. Power Transmission, Electronic Communication, Transportation, Structures, Automotive, Roads, etc.)							
Organogram showing Supervisor (person signing this report), co-workers and those you supervised (if any). Show two levels above and below, if these exist. Give names, positions, qualification and registration (if any)*. Please do not colour in blocks.							

Report: (Write in proper paragraphs in the first person singular in less than 280 words)

Nature of training or experience (stated in 20-30 words)*
Nature of problem(s) addressed in this period; method of analysis, developing solution and evaluation (stated in 120- 150 words)*
Interaction with clients, stakeholders and other disciplines (stated in 40-50 words)

Describe role and responsibility (in 40-50 words)*	Degree of responsibility:	Tick one only*
	A. Being exposed, under full supervision	
	B. Assisting, responsibility limited	
	C. Participating, supervision limited	
	D. Contributing, performs work, detailed approval	
	E. Performing, limited guidance	

*Mandatory fields

Engineering Council of South-Africa

Training and Experience Summary — Form C2.2 (2014-07-17)

Surname and Initials:

First complete a Training and Experience Report Form C2.1 TER, or a Training and Experience Outline Form C2.1 TEO for each period.

No	From	To	Weeks	Work Details		Responsibility A-E
1				Employed by:	Post held:	
				Type of Work:		
2				Employed by:	Post held:	
				Type of Work:		
3				Employed by:	Post held:	
				Type of Work:		
4				Employed by:	Post held:	
				Type of Work:		
5				Employed by:	Post held:	
				Type of Work:		
6				Employed by:	Post held:	
				Type of Work:		
7				Employed by:	Post held:	
				Type of Work:		
8				Employed by:	Post held:	
				Type of Work:		
9				Employed by:	Post held:	
				Type of Work:		
n				Employed by:	Post held:	
				Type of Work:		

When an applicant is not engaged in training and experience towards registration, the period must be reflected as follows:

x				Employed by: ***Not active***	Post held:	
				Type of Work: ***Insert reason here***		
Total years, months:						

Signature of Applicant: _____ **Date:** _____

Pre-registration CPD-type Activity Report (IPD)				
Applicant's Name:				
Date(s) attended*	Provider*:	Name of Course*	Hours*:	Validating body
Venue*:	Lead presenter*:	Type*:	Points	Validation No:
Date(s) attended*	Provider*:	Name of Course*	Hours*:	Validating body
Venue*:	Lead presenter*:	Type*:	Points	Validation No:
Date(s) attended*	Provider*:	Name of Course*	Hours*:	Validating body
Venue*:	Lead presenter*:	Type*:	Points	Validation No:
Date(s) attended*	Provider*:	Name of Course*	Hours*:	Validating body
Venue*:	Lead presenter*:	Type*:	Points	Validation No:

* Compulsory field

INITIAL PROFESSIONAL DEVELOPMENT REPORT (IPD)

As part of the Application for Registration as a Professional Engineering Technologist

Name:

Discipline:

Itemise courses, workshops, conferences, symposia or congresses attended.
List these under the separate headings of engineering, management and computer courses.

Name or subject of item	*Course Provider*	*Dates attended*	SAQA NQF level if available	Duration in hours	Credits	For use of Assessor
Engineering Courses						
Management Courses						
Computer Courses						

Signature of Applicant **Date**

INITIAL PROFESSIONAL DEVELOPMENT REPORT (IPD)

As part of the Application for Registration as a Professional Engineering Technician

Name:

Discipline:

Itemise courses, workshops, conferences, symposia or congresses attended.
List these under the separate headings of engineering, management and computer courses.

Name or subject of item	*Course Provider*	*Dates attended*	SAQA NQF level if available	Duration in hours	Credits	For use of Assessor
Engineering Courses						
Management Courses						
Computer Courses						

Signature of Applicant **Date**

PLATO

WORK INTEGRATED LEARNING FOR GISc TECHNICIANS

Full Name of Candidate: .....

Dates	Work description	No. of Working days							
		IT Skills	Data Collection & Capture	Data Manipulation	Reproduction Procedures	Spatial Modelling	Map Production	Photogrammetric Compilation	Image Processing
Compulsory Training (CT): 80 working days		CT10	CT 15	CT15	CT 5	CT20	CT15	AT	AT
Additional Training (AT): Not less than 140 working days in any one of the above categories of work, of which not less than 10 days or more than 100 days in any one category can be included, with the provision that work in at least three of the categories must be included. Note AT includes the categories marked for CT.									
Update Totals	TOTAL	0	0	0	0	0	0	0	0

I certify that the training indicated above has been performed under my personal supervision.

Signed by Mentor: ..... **Date .....**

Print name: ..... **PLATO registration: .....**

Candidate signature..... **Date .....**

PLATO

WORK INTEGRATED LEARNING FOR GISc TECHNOLOGIST

Full Name of Candidate: .....

ates	Work description	No. of Working days											
		Data Collection and capture	Data Manipulation	Reproduction Procedures	Database and Spatial Modelling	Map Production	Spatial Statistics and interpolation	Spatial Analysis	Remote Sensing and photogrammetry	Project Management	Spatial Information management, manipulation and recovery	Spatial Data Quality assessment ad error management	TOTAL
npulsory Training (CT): **120 working days**		CT20	CT15	CT5	CT15	CT20	CT5	CT10	CT10	CT20	AT	AT	
itional Training (AT): **Not less than 100 working days in at least three of the following, provided that not less an 10 working days or more than 40 are done in any one of the categories.**													
Update Totals	TOTAL	0	0	0	0	0	0	0	0	0	0	0	0

I certify that the training indicated above has been performed under my personal supervision.

Signed by Mentor: ..... **Date** .....

Print name: ..... **PLATO registration:** .....

Candidate signature..... **Date** .....

PLATO

WORK INTEGRATED LEARNING FOR PROFESSIONAL GISc PRACTITIONERS

Full Name of Candidate: .....

Dates	Work description	No. of Working days										
		Data Collection and capture	Data Manipulation	Reproduction Procedures	Database and Spatial Modelling	Map Production	Spatial Statistics and interpolation	Spatial Analysis	Remote Sensing and photogrammetry	Project Management	Spatial Information management, manipulation and recovery	Spatial Data Quality assessment and error management
Compulsory Training (CT): **120 working days**		CT20	CT15	CT5	CT15	CT20	CT5	CT10	CT10	CT20	AT	AT
Additional Training (AT): **Not less than 100 working days in at least three of the following, provided that not less than 10 working days or more than 40 are done in any one of the categories.**												
Update Totals	TOTAL	0	0	0	0	0	0	0	0	0	0	0

I certify that the training indicated above has been performed under my personal supervision.

Signed by Mentor: ..... **Date** .....

Print name: ..... **PLATO registration:** .....

Candidate signature..... **Date** .....

PROJECT WORK STAGES	KNOWLEDGE OF STANDARD SERVICE	DELIVERABLES	DESCRIPTION OF EXPERIENCE
1. PROJECT INITIATION AND BRIEFING Agreeing client requirements and preferences, assessing user needs and options, appointment of necessary consultants in establishing project brief, objectives, priorities, constraints, assumptions and strategies in consultation with the client.	1.1. Facilitate the development of a Clear Project Brief 1.2. Establish the client's Procurement Policy for the Project 1.3. Assist the client in the procurement of the necessary and appropriate consultants including the clear definition of their roles, responsibilities and liabilities. 1.4. Establish in conjunction with the client, consultants, and all relevant authorities the site characteristics necessary for the proper design and approval of the intended project 1.5. Manage the integration of the preliminary design to form the basis for the initial viability assessment of the project 1.6. Prepare, co-ordinate and monitor a Project Initiation Programme 1.7. Facilitate the preparation of the Preliminary Viability Assessment of the project 1.8. Facilitate client approval of all Stage 1 documentation 1.9. Facilitate client approval of all Stage 1 documentation	• Project Brief • Project Procurement Policy • Signed Consultant / Client Agreements • Project initiation Programme • Record of all Meetings • Approval by Client to proceed to Stage 2	
NAME OF CANDIDATE:	**SIGNATURE:**	**REGISTRATION NUMBER:**	
NAME AND DURATION OF THE PROJECT:		**PERIOD WORKING ON THIS STAGE:**	
NAME OF THE MENTOR:	**SIGNATURE:**	**REGISTRATION NUMBER OF MENTOR:**	

PROJECT WORK STAGES	KNOWLEDGE OF STANDARD SERVICE	DELIVERABLES	DESCRIPTION OF EXPERIENCE
2. CONCEPT AND FEASIBILITY	2.1. Assist the client in the procurement of the necessary and appropriate consultants including the clear definition of their roles, responsibilities and liabilities.	• Signed Consultant/Client Agreements • Indicative Project Documentation and Construction Programme • Approval by Client to proceed to Stage 3	
Finalization of the project concept and feasibility	2.2. Advise the client on the requirement to appoint a Health and Safety Consultant		
	2.3. Communicate the project brief to the consultants and monitor the development of the Concept and Feasibility within the agreed brief		
	2.4. Co-ordinate and integrate the income stream requirements of the client into the concept design and feasibility		
	2.5. Agree the format and procedures for cost control and reporting by the cost consultants on the project.		
	2.6. Manage and monitor the preparation of the project costing by other consultants		
	2.7. Prepare and co-ordinate an Indicative Project Documentation and Construction Programme		
	2.8. Manage and integrate the concept and feasibility documentation for presentation to the client for approval		
	2.9. Facilitate client approval of all Stage 2 documentation		
NAME OF CANDIDATE:	**SIGNATURE:**	**REGISTRATION NUMBER:**	
NAME AND DURATION OF THE PROJECT:		**PERIOD WORKING ON THIS STAGE:**	
NAME OF THE MENTOR:	**SIGNATURE:**	**REGISTRATION NUMBER OF MENTOR:**	

PROJECT WORK STAGES	KNOWLEDGE OF STANDARD SERVICE	DELIVERABLES	DESCRIPTION OF EXPERIENCE
3. DESIGN DEVELOPMENT	3.1. Assist the client in the procurement of the balance of the consultants including the clear definition of their roles, responsibilities and liabilities.	• Signed Consultant/Client Agreements • Detailed Design ad Documentation Programme • Updated Indicative Construction Programme • Record of all Meetings approval by Client to proceed to Stage 4	
Manage, co-ordinate and integrate the detail design development process within the project scope, time, cost and quality parameters.	3.2. Establish and co-ordinate the formal and informal communication structure, processes and procedures for the design development of the project.		
	3.3. Prepare, co-ordinate and agree a detailed Design and Documentation Programme, based on an updated Indicative Construction Programme, with all consultants		
	3.4. Manage, co-ordinate and integrate the design by the consultants in a sequence to suit the project design, documentation programme and quality requirements.		
	3.5. Conduct and record the appropriate planning, co-ordination and management meetings		
	3.6. Facilitate any input from the design consultants required by Construction Manager on constructability.		
	3.7. Facilitate any input from the design consultants required by Health and Safety consultant		
	3.8. Manage and monitor the timeous submission by the design team of all plans and documentation to obtain the necessary statutory approvals		
	3.9. Establish responsibilities and monitor the information flow between the design team, including the cost consultants.		

	3.10. Monitor the preparation by the cost consultants of cost estimates, budgets, and cost reports 3.11. Monitor the cost control by the cost consultants to verify progressive design compliance with approved budget, including necessary design reviews to achieve budget compliance 3.12. Facilitate and monitor the timeous technical co-ordination of the design by the design team 3.13. Facilitate client approval of all Stage 3 documentation		
NAME OF CANDIDATE:	**SIGNATURE:**	**REGISTRATION NUMBER:**	
NAME AND DURATION OF THE PROJECT:		**PERIOD WORKING ON THIS STAGE:**	
NAME OF THE MENTOR:	**SIGNATURE:**	**REGISTRATION NUMBER OF MENTOR:**	

PROJECT WORK STAGES	KNOWLEDGE OF STANDARD SERVICE	DELIVERABLES	DESCRIPTION OF EXPERIENCE
4. TENDER, DOCUMENTATION AND PROCUREMENT The process of establishing and implementing procurement strategies and procedures, including the preparation of necessary documentation, for effective and timeous execution of the project.	4.1. Select, recommend and agree the Procurement Strategy for contractors, subcontractors and suppliers with the client and consultants 4.2. Prepare and agree the Project Procurement Programme. 4.3. Co-ordinate and monitor the preparation of the tender documentation by the consultants in accordance with the Project Procurement Programme. 4.4. Facilitate and monitor the preparation by the Health and Safety Consultant of the Health and Safety Specification for the project 4.5. Manage the tender process in accordance with agreed procedures, including calling for tenders, adjudication of tenders, and recommendation of appropriate contractors for approval by the client. 4.6. Advice the client, in conjunction with other consultants on the appropriate insurances required for the implementation of the project. 4.7. Monitor the reconciliation by the cost consultants of the tender prices with the project budget 4.8. Agree the format and procedures for monitoring and control by the cost consultants of the cost of the works. 4.9. Facilitate client approval of the tender recommendation(s).		
NAME OF CANDIDATE:	**SIGNATURE:**	**REGISTRATION NUMBER:**	
NAME AND DURATION OF THE PROJECT:		**PERIOD WORKING ON THIS STAGE:**	
NAME OF THE MENTOR:	**SIGNATURE:**	**REGISTRATION NUMBER OF MENTOR:**	

PROJECT WORK STAGES	KNOWLEDGE OF STANDARD SERVICE	DELIVERABLES	DESCRIPTION OF EXPERIENCE
5. CONSTRUCTION DOCUMENTATION AND MANAGEMENT The management and administration of the construction contracts and processes, including the preparation and co-ordination of the necessary documentation to facilitate effective execution of the works.	5.1. Appoint contractor(s) on behalf of the client including the finalization of all agreements 5.2. Instruct the contractor on behalf of the client to appoint subcontractors. 5.3. Receive, co-ordinate, review and obtain approval of all contract documentation provided by the contractor, subcontractors, and suppliers for compliance with all of the contract requirements. 5.4. Monitor the ongoing projects insurance requirements. 5.5. Facilitate the handover of the site to the contractor. 5.6. Establish and co-ordinate the formal and informal communication structure and procedures for the construction process. 5.7. Regularly conduct and record the necessary site meetings 5.8. Monitor, review and approve the preparation of the Contract Programme by the contractor. 5.9. Regularly monitor the performance of the contractor against the Contract Programme. 5.10. Review and adjudicate circumstances and entitlements that may arise from any changes required to the Contract Programme. 5.11. Monitor the preparation of the contractor's Health and Safety Plan and approval thereof by the Health and Safety Consultant. 5.12. Monitor the auditing of the Contractors' Health and Safety Plan by the Health and Safety Consultant.	• Signed Contractor(s) Agreements • Agreed Contract Programme • Adjudication and Award of Contractual Claims • Construction Documentation Schedule • Monthly Progress Payment Certificates • Monthly Project Progress Reports • Record of all Meetings • Certificates of Practical Completion	

PROJECT WORK STAGES	KNOWLEDGE OF STANDARD SERVICE	DELIVERABLES	DESCRIPTION OF EXPERIENCE
	5.13. Monitor the compliance by the contractors of the requirements of the Health and Safety Consultant.		
	5.14. Monitor the production of the Health and Safety File by the Health and Safety Consultant and contractors		
	5.15. Monitor the preparation by the Environmental Consultants of the Environmental Management Plan		
	5.16. Establish the construction information distribution procedures.		
	5.17. Agree and monitor the Construction Documentation Schedule for timeous delivery of required information to the contractors.		
	5.18. Expedite, review and monitor the timeous issue of construction information to the contractors.		
	5.19. Manage the review and approval of all necessary shop details and product propriety information by the design consultants.		
	5.20. Establish procedures for monitoring, controlling and agreeing all scope and cost variations.		
	5.21. Agree the quality assurance procedures and monitor the implementation thereof by the consultants and contractors.		
	5.22. Monitor, review, approve and certify monthly progress payments.		
	5.23. Receive, review and adjudicate any contractual claims.		
	5.24. Monitor the preparation the preparation of monthly cost reports by the cost consultants.		
	5.25. Monitor long lead items and off-site production by the contractors and suppliers.		

PROJECT WORK STAGES	KNOWLEDGE OF STANDARD SERVICE	DELIVERABLES	DESCRIPTION OF EXPERIENCE
	5.26. Prepare monthly project reports including submission to the client		
	5.27. Manage, co-ordinate and monitor all necessary testing and commissioning by consultants and contractors.		
	5.28. Co-ordinate, monitor and issue the Practical Completion Lists and the Certificate of Practical Completion.		
	5.29. Co-ordinate and monitor the preparation and issue of the Works Completion List by the consultants to the contractors.		
	5.30. Monitor the execution by the contractors of the defect items to achieve Works Completion.		
	5.31. Facilitate and co-ordinate adequate access with the occupant for the rectification of defects by the contractors		
NAME OF CANDIDATE:	**SIGNATURE:**	**REGISTRATION NUMBER:**	
NAME AND DURATION OF THE PROJECT:		**PERIOD WORKING ON THIS STAGE:**	
NAME OF THE MENTOR:	**SIGNATURE:**	**REGISTRATION NUMBER OF MENTOR:**	

PROJECT WORK STAGES	KNOWLEDGE OF STANDARD SERVICE	DELIVERABLES	DESCRIPTION OF EXPERIENCE
6. PROJECT CLOSE OUT The process of managing and administering the project closeout, including preparation and co-ordination of the necessary documentation facilitate the effective operation of the project	6.1. Issue the Works Completion Certificate 6.2. Manage, co-ordinate and expedite the preparation by the design consultants of all as-built drawings and design documentation. 6.3. Manage and expedite the procurement of all operating and maintenance manuals as well as all warrantees and guarantees. 6.4. Manage and expedite the procurement of all statutory compliance certificates and documentation. 6.5. Manage the finalization of the Health and Safety File for submission to the Client. 6.6. Co-ordinate, monitor and manage the rectification of defects during the Defects Liability Period. 6.7. Manage, co-ordinate and expedite the preparation and agreement of the final account by the cost consultants with the relevant contractors. 6.8. Co-ordinate, monitor and issue the Final Completion Defects list and Certificate of Final Completion. 6.9. Prepare and present Project Closeout Report.	• Works Completion Certificates • Certificate of Final Completion • Record of all Meetings Project Close-out report	
NAME OF CANDIDATE:	**SIGNATURE:**	**REGISTRATION NUMBER:**	
NAME AND DURATION OF THE PROJECT:		**PERIOD WORKING ON THIS STAGE:**	
NAME OF THE MENTOR:	**SIGNATURE:**	**REGISTRATION NUMBER OF MENTOR:**	

❖ **Please note that for Candidate Construction Managers, the work stages start from 4 to 6**

All applicants are required by the Council, therefore by law, to complete the following report

Annexure A1

Project Profile (List of Projects) involved in last 4 years indicate the Following;

- ☐ Name of Project
- ☐ Type and Description of Project
- ☐ Geographical Location of Project
- ☐ Name of Client and Position and Contact Details of Client Representative
- ☐ List of Participating Organizations
- ☐ Original Completion Date and Actual Completion Date
- ☐ Percentage of Practical Completion
- ☐ Total value of Project
- ☐ Percentage participation of your organization in the project
- ☐ Your specific role in the project
- ☐ Was the project successfully completed.

SACPLAN – Practical Training Report

Name of Applicant :

Registration number as Candidate :

Application for Registration as :

Employer and Business Address:						
Period:					**Number of Months:**	
Category of Work (As per Rules)	**Type of Work (As per Rules)**	**Project Title & (Duration of Project)**	**Scope of Project**	**Your Responsibilities Undertaken**	**Time (Actual Time in Months or part thereof)**	**Name, Signature, and Registration No. of SACPLAN Supervisor / Mentor**

SACQSP – Activity Summary

To be printed out from the online system for discussion with Mentor.

Activity Summary

26/10/2015

Themba Demana
Reg #:1T6022
Mentor:Onwaba Kanya Tselane (4258)

	Hours	Target Hours	% of Target
1.0 - Inception - 5%			
1.1 Developing project briefs and attending project initiation meetings	0.0	85.5	0.0
1.2 Advising on procurement policy for the project.	0.0	57.0	0.0
1.3 Defining the quantity surveyors scope of work and services, services agreements	0.0	57.0	0.0
1.4 Advising on factors affecting the project and on appropriate financial design criteria	0.0	85.5	0.0
Section Total:	0.0		
2.0 - Concept and Viability - 10%			
2.1 Agreeing project documentation programme	0.0	57.0	0.0
2.2(#) Reviewing and evaluating design concept / value engineering	34.0	128.2	26.5
2.3 Preparing preliminary estimates of construction cost	280.0	171.0	163.7
2.4(#) Assisting in preparation of financial viability reports/feasibility studies	365.2	171.0	213.5
2.5(#) Auditing space allocations against the initial brief.	0.0	57.0	0.0
Section Total:	679.2		
3.0 - Design Development - 15%			
3.1 Reviewing design and outline specifications and exercising cost control	0.0	162.4	0.0
3.1 Reviewing the documentation programme	0.0	42.7	0.0
3.2 Reviewing design and outline specifications and exercising cost control	0.0	128.2	0.0
3.3 Preparing detailed estimates of construction cost	77.0	427.5	18.0
3.4 Reviewing the financial viability report / audit of Cost Budget Estimates	0.0	128.2	0.0
3.5(#) Preparing area schedules and advising on space and accommodation allowances	0.0	42.7	0.0
3.6 Advising on escalation formulae and their project implication	0.0	85.5	0.0
Section Total:	77.0		
4.0 - Documentation and procurement - 20%			
4.01 Assisting in the formulation of procurement strategy for contractors, sub-contractors and suppliers	0.0	57.0	0.0
4.10 Preparing contract documents	68.0	28.5	238.5
4.11 (*) Understanding the roles, requirements and responsibilities of cost engineers and the use of cost elements (WBS)	0.0	28.5	0.0
4.12 (#) Preparation of health and safety requirements for building projects	16.5	57.0	28.9
4.13 (*) Preparation and application of health and safety requirements per engineers requirements, particularly on Mining Projects	0.0	57.0	0.0
4.02 Reviewing working drawings for compliance with the approved budget for construction cost and/or financiall viability	0.0	114.0	0.0
4.03 Preparing documentation for both principal and subcontract procurement including the measurement and design of work, and the drafting of preliminaries, preambles and contract conditions	85.5	228.0	37.5
4.04 Taking off of quantities and preparing price determination documents, including abstracts, schedules and pricing specialist construction elements in accordance with industry practice norms	502.0	399.0	125.8

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	Hours	Target Hours	% of Target
4.05(*) Preparing schedules of quantities for engineering works (civils, structural, piping and electrical) and the various methods of measurement	422.5	399.0	105.8
4.06 Advising on selection of tenderers	48.0	57.0	84.2
4.07 Calling of tenders and/or negotiation of prices	33.0	114.0	28.9
4.08 Evaluating and reporting on tenders, including clarification meetings	76.5	57.0	134.2
4.09 Preparing contract documents	17.0	28.5	59.6
Section Total:	1269.0		
5.0 - Construction - 35%			
5.1 Attending site handover and regular site, technical and progress meetings	34.5	228.0	15.1
5.2 Preparing schedules of predicted cash flow	0.0	171.0	0.0
5.3 Cost control during progress of the works including advising on proposed variations and on alternative construction methods and sequencing	0.0	285.0	0.0
5.4 Reporting on cost variations and contractual issues	16.0	171.0	9.3
5.5 Adjudication and resolving financial claims by the contractor, subcontractors and/or suppliers	419.5	285.0	147.1
5.6 Preparation of valuations for interim payment certificates and reconciliation statements	40.0	570.0	7.0
5.7 Measuring and recording site information for final account purposes	78.0	285.0	27.3
Section Total:	588.0		
6.0 - Close Out - 10%			
6.1 Preparing and agreeing final account(s)	85.0	285.0	29.8
6.2 Prepar valuations for final Payment certificates and reconciliation statements	45.0	228.0	19.7
6.3 Preparing fee accounts based on appropriate fee scale and conditions of appointment	0.0	57.0	0.0
Section Total:	130.0		
7.0 - Specialization - 5%			
7.1 Project planning and project management	0.0	5.7	0.0
7.11 planning or programming of contract works	0.0	57.0	0.0
7.12 procurement of plant and materials	0.0	57.0	0.0
7.13 resource determination, scheduling and purchasing	0.0	57.0	0.0
7.2 Dilapidations and maintenance	0.0	2.8	0.0
7.3 Office management, resource allocation and budgeting	0.0	57.0	0.0
7.4 Taxation allowance and grants	0.0	28.5	0.0
7.5 Insurance	0.0	2.8	0.0
7.6 Litigation and arbitration	0.0	2.8	0.0
7.7 Insolvency and liquidation	0.0	2.8	0.0
Section Total:	0.0		

Minimum Required Hours:5700 **Credit Hours:0** **Total for Candidate** 2743.2

Activity by Project Summary

To be printed out from the online system for discussion with Mentor.

Activity by Project Summary
26/10/2015

Themba Demana

		Hours
Anglo American Kumba Iron Ore K1293-Sishen New HME		
4.0 - Documentation and procurement - 20%		384.5
Anglo American Kumba Iron Ore K1293-Sishen New HME	**Total Hours:**	384.5
ASSMANG : SECURITY FOR MINE ENTRANCE		
3.0 - Design Development - 15%		10.0
4.0 - Documentation and procurement - 20%		18.0
ASSMANG : SECURITY FOR MINE ENTRANCE	**Total Hours:**	28.0
ASSMANG: Salvage Yard Hazardous Waste Storage & Al		
4.0 - Documentation and procurement - 20%		7.0
ASSMANG: Salvage Yard Hazardous Waste Storage & Al	**Total Hours:**	7.0
GOUNKOTO SLUDGE TREATMENT (Rand Gold Resources)		
2.0 - Concept and Viability - 10%		88.0
GOUNKOTO SLUDGE TREATMENT (Rand Gold Resources)	**Total Hours:**	88.0
Impala 20 shaft complex		
4.0 - Documentation and procurement - 20%		32.0
6.0 - Close Out - 10%		8.0
Impala 20 shaft complex	**Total Hours:**	40.0
Kibali Gold Project (Shaft Station Steelwork)		
4.0 - Documentation and procurement - 20%		80.0
Kibali Gold Project (Shaft Station Steelwork)	**Total Hours:**	80.0
Kibali Gold Project (Surface Infrastructure)		
4.0 - Documentation and procurement - 20%		137.5
Kibali Gold Project (Surface Infrastructure)	**Total Hours:**	137.5
Morobe Mining JV Services Australia Pty Ltd		
2.0 - Concept and Viability - 10%		190.0
3.0 - Design Development - 15%		27.0
4.0 - Documentation and procurement - 20%		162.0
Morobe Mining JV Services Australia Pty Ltd	**Total Hours:**	379.0
Project: Assmang Khumani - 3rd Party Product Yard		
3.0 - Design Development - 15%		12.0
Project: Assmang Khumani - 3rd Party Product Yard	**Total Hours:**	12.0

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		Hours
Sasol Wax Infrastructure and Facilities Upgrade (S		
2.0 - Concept and Viability - 10%		16.5
4.0 - Documentation and procurement - 20%		129.5
5.0 - Construction - 35%		8.5
Sasol Wax Infrastructure and Facilities Upgrade (S	**Total Hours:**	**154.5**
Somilo - Societe des Mines de Loulo SA		
4.0 - Documentation and procurement - 20%		18.0
Somilo - Societe des Mines de Loulo SA	**Total Hours:**	**18.0**
Styldrift 1 Shaft project execution		
4.0 - Documentation and procurement - 20%		166.0
5.0 - Construction - 35%		27.0
Styldrift 1 Shaft project execution	**Total Hours:**	**193.0**
Styldrift 1 Shaft: Ablution and Sensitiser Buildin		
4.0 - Documentation and procurement - 20%		91.0
5.0 - Construction - 35%		9.0
Styldrift 1 Shaft: Ablution and Sensitiser Buildin	**Total Hours:**	**100.0**
Telkom SA limited Luipaartsvlei Restoration Projec		
3.0 - Design Development - 15%		28.0
Telkom SA limited Luipaartsvlei Restoration Projec	**Total Hours:**	**28.0**
Tullow oil : Infrastructure & Logistics Concept S		
2.0 - Concept and Viability - 10%		200.0
Tullow oil : Infrastructure & Logistics Concept S	**Total Hours:**	**200.0**
VOC ABATEMENT (SASOL TECHNOLOGY (Pty) Ltd		
2.0 - Concept and Viability - 10%		9.0
5.0 - Construction - 35%		543.5
6.0 - Close Out - 10%		122.0
VOC ABATEMENT (SASOL TECHNOLOGY (Pty) Ltd	**Total Hours:**	**674.5**
York Potash DFS project		
2.0 - Concept and Viability - 10%		175.7
4.0 - Documentation and procurement - 20%		43.5
York Potash DFS project	**Total Hours:**	**219.2**
Total	**Total Hours:**	**2743.2**

national treasury

Department:
National Treasury
REPUBLIC OF SOUTH AFRICA

TRAINING PLANS AND CONSIDERING OUTCOMES ISDG PROGRAMME

October 2016

Contents

INTRODUCTION

SAICE – PDP has been appointed by National Treasury to implement a quality management programme for the ISDG Programme. We have visited the majority of participating municipalities and have determined that there is no consistency in reporting and the development of Training Plans for candidates, based on their levels of responsibility and complexity achieved.

Training plans

To ensure that candidates progress within the limited time frames of the programme, candidates require a long term training plan and projects/activities to ensure that the site at which they are placed offers adequate experience for him/her to successfully register. Detailed training plans must be developed and must be reviewed regularly, in accordance with the performance and progress of the candidates.

This document is intended to introduce a standard format for training plans to ensure that candidates are exposed to an adequate variety of work, and to indicate specific outcomes that are to be achieved in the execution of activities. Furthermore, the training plans need to consider the current level of responsibility and complexity that the candidate is working at, and the targeted levels of capability/competence and responsibility that need to be achieved.

Outcomes Assessments

Outcomes assessment is the process that guides the candidate's progress towards registration and ought to be the planning tool for candidate training, the content and nature of assignments and the scheduling of Initial Professional Development (Training and Research) activities.

Candidates must be assessed on activities quarterly, and outcomes twice annually to identify corrective action and amendments, development of assignments and to set targets for the next quarter. These amendments and targets must be incorporated into the candidate training plans.

The assessments must distinguish between the candidate's capability to perform activities in accordance with the recommended identified work of the Statutory Council (SC) and the outcome requirements such as problem solving, managing activities, to consider the impacts of activities, apply sound judgement and responsible decision making.

The mentors must ensure that a holistic assessment is made to form an opinion of how the candidate has progressed, to identify specific areas and activities that need attention, and training activities that need to be planned for the next period.

The requirements of statutory councils

Candidates have been selected from the majority of SCs and in various categories of registration. The SC requirements are varied and fairly complex and it is understandable that mentors may not be conversant in the activity and outcome requirements of each SC for the respective categories of registration. Furthermore, the assessment of competence/capability and procedural competence is essential to ensure meaningful planning of training.

Hence, it has been recommended that mentors receive training and orientation in the requirements of the SCs, assessment of candidates and the development of training plans.

STATUTORY COUNCIL REQUIREMENTS

Outcomes

The professions have a common requirement – to develop professionals who are competent to:

1. Investigate and solve problems
2. Implement solutions
3. Consider impacts
4. Behave ethically
5. Apply sound judgement and make responsible decisions
6. Continually develop professionally

Each SC describes the above attributes slightly differently, but nevertheless require that these outcomes are achieved in the summative assessment.

Capable (or Professionally Competent) practitioners are expected to demonstrate that they can independently or (at most) with limited guidance, perform the process, make appropriate decisions and lead or supervise others whilst **experienced (or Procedurally Competent)** practitioners are expected to demonstrate that they have independently, or under supervision, performed specific processes.

Typically, for instance, a doctor may have been taught to remove tonsils, but he or she would not be considered professionally competent until he or she is **capable** of investigating the patient's complaints, diagnosing the problem, making the decision to operate, considering impacts and complications (such as infection and allergies) and taking responsibility for removing the tonsils, having considered all the risks.

In the same way, developing built environment and scientific professionals requires more than teaching candidates to follow processes. They should ultimately be capable of demonstrating the attributes listed above. These attributes will be the desired outcomes for each professional stream in slightly varying forms.

SAQA level descriptors

Although there may be slight variations in terminology these attributes are common across all SCs and are in accordance with the South African Qualifications Authority (SAQA) level descriptors. The outcomes will be covered in detail in each specific SC guideline.

In classifying qualifications from level 1 to 10, the SAQA considers the complexity of the following outcomes per level on the National Qualifications Framework (NQF):

1. Scope of knowledge
2. Knowledge literacy
3. Method and procedure
4. Problem solving
5. Ethics and professional practice
6. Accessing, processing and managing information
7. Producing and communicating of information
8. Context and systems
9. Management of learning
10. Accountability

With increasing NQF levels, learners are expected to learn more independently and take on increased responsibility levels and complexity of work. The important level descriptors, in terms of the work of a professional, are selecting methods and procedures, solving problems and taking responsibility/being

accountable. A comparison of what is expect of NQF 6, 7 and 8 is shown in the Table 1, where NQF 6 relates to technicians, NQF 7 to technologists and NQF 8 to professionals.

Table 1: NQF Level descriptors and the associated expectations

	NQF 6	NQF 7	NQF 8
METHOD AND PROCEDURE	Able to demonstrate an ability to evaluate, **select and apply appropriate methods, procedures or techniques in processes of investigation or application within a defined context**	Able to demonstrate: an **understanding** of a range of methods of enquiry in a field, discipline or practice, and their **suitability to specific investigations**; and an ability to **select and apply a range of methods to resolve problems** or introduce change within a practice	Able to demonstrate an understanding of the **complexities and uncertainties** of selecting, applying or transferring appropriate standard procedures, processes or techniques to **unfamiliar problems** in a specialised field, discipline or practice
PROBLEM SOLVING	Able to demonstrate an ability to **identify, analyse and solve problems in unfamiliar contexts**, gathering evidence and applying solutions based on evidence and procedures appropriate to the field, discipline or practice	Able to demonstrate an ability to **identify, analyse, evaluate, critically reflect on and address complex problems**, applying evidence-based solutions and theory-driven arguments	Able to demonstrate an ability to use a range of specialised skills to **identify, analyse and address complex or abstract problems** drawing systematically on the body of knowledge and methods appropriate to a field, discipline or practice
ACCOUNTABILITY	Able to demonstrate an ability to work effectively in a team or group, and to **take responsibility for his or her decisions and actions and the decisions and actions of others within well-defined contexts**, including the responsibility for the use of resources where appropriate	Able to demonstrate an ability to **take full responsibility for his or her work, decision-making and use of resources**, and limited accountability for the decisions and actions of others in varied or ill-defined contexts	Able to demonstrate an ability to **take full responsibility for his or her work, decision-making and use of resources, and full accountability for the decisions and actions of others** where appropriate

THE PROFESSIONAL DEVELOPMENT PROCESS

The focus of candidacy programmes is not on attending courses but on gaining work experience in a team delivering technical solutions. Candidates should engage in a sequence of activities that may be the completion of a particular aspect of training or unit of work as shown as a development phase in Figure 1. Each of the development phases consists of the following sequenced activities:

- Planning
- Working in a team (including training)
- Recording and reporting
- Reviewing and assessing

The training process is governed by standards, policies and procedures. For each of the development phases, the candidate, working with the supervisor and mentor, sets and documents the competency development objectives of the phase. At the end of the phase, they review the achievements of the just-completed phase against the objectives that were set for the phase. Objectives are then set for the next phase.

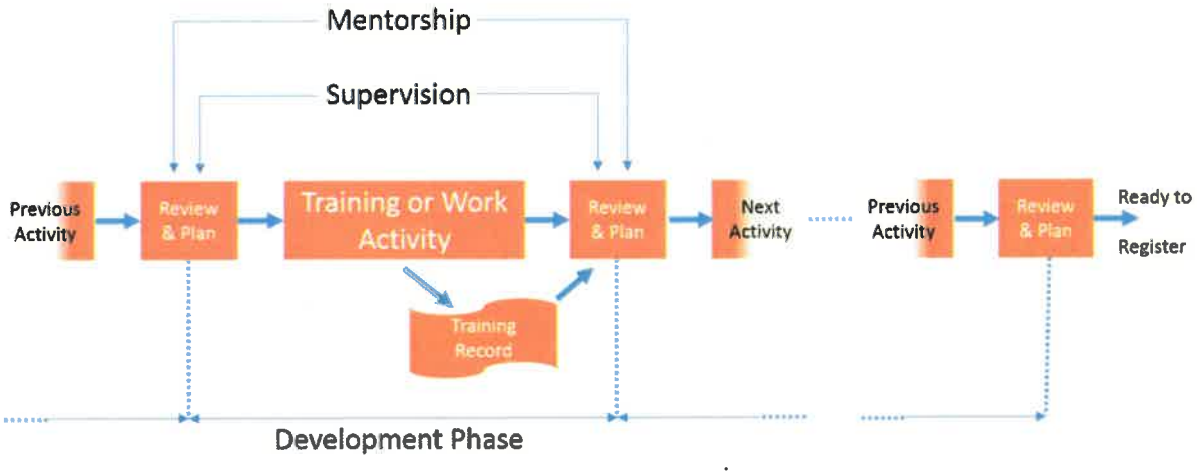

Figure 1: Main elements of the professional development process through a candidacy programme

Planning principles

When selecting and agreeing on activities for candidates to work on during each phase, the following three principles must be incorporated into the planning process:

- **Competencies and complexity** – the activities must focus on the **competencies** to be developed including the **complexity** of work
- **Variety of work** – a **variety of work activities** is necessary for the proper development of a candidate. The object of having a variety of work is to broaden the experience of the candidate and to ensure that all aspects of competency are developed and ultimately assessed
- **Increasing responsibility and accountability** – within the organisation, increasing responsibility and accountability must be imposed on, and accepted by the candidate until he or she is capable of accepting professional responsibility in making and executing decisions at the exit level

The responsibility table, Table 2 is used by many Statutory Councils to describe the change in roles as the candidate takes on more and more responsibility for his or her work, and progresses towards autonomy.

Table 2: INCREASING DEGREE OF RESPONSIBILITY

Level	Nature of work : The Candidate	Responsibility of Candidate	Level of Supervisor/ Mentor Support
A. Being Exposed	Undergoes induction, observes work of competent practitioners	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 feed back
C. Participating	Performs specific processes as directed with limited supervision	Full responsibility for supervised work	Supervisor progressively reduces support
D. Contributing	Performs specific work with detailed approval of work outputs	Full responsibility to supervisor for immediate quality of work	Candidates articulates own reasoning and compare it with those of supervisor
E. Performing (Responsible but not accountable)	Works in team without supervision, recommends work outputs	Responsibility to supervisor is appropriate to a registered person	Candidates takes on problem solving without support, at most limited guidance

The training plan

The Training Plan is a document, which outlines the **activities** that candidates will be involved in during the next 6 to 12 months and the **responsibility level** and **outcomes** they are likely to be working towards. When considering the outcomes, it is essential that the **complexity** of work is also taken into account. In the case of ECSA, complexity is built into the Outcomes statements. In the case of other Statutory Councils, the SAQA definitions need to be considered for problem solving at the appropriate level.

The Training Plan is a living document, which will continue to change as priorities on projects change, projects are put on hold, and other emergency projects are taken on, such as in cases of natural disasters, breakages, etc. Candidates, supervisors and mentors should learn to be flexible as the Training Plan will keep changing. During reviews, it is essential to discuss the Training Plan to ensure that candidates are getting adequate exposure, and to look at additional activities, which should be added for future periods. It is suggested that at all times mentors should test whether the:

- Nature of practical training (relevance)
- Standard of practical training
- Variety of practical training

is adequate to take candidates towards professional registration.

Documenting and reviewing training and experience

The phase-by-phase planning (as captured in the Training Plan) and review of the candidate's training must be supported by documentation, both for the immediate purpose of managing training and for compiling evidence when the candidate comes to apply for registration. Statutory Council templates should be used for ongoing reporting, or the appropriate online system for logging activities.

Assessments

FORMATIVE ASSESSMENTS

Regular assessments, preferably at least quarterly, should take place to ensure that candidates are making progress. These assessments would review progress with the range of activities or work stages. More rigorous assessments relating to readiness for registration, which are discussed under summative assessments, should also be carried out from time to time, at least twice annually.

SUMMATIVE ASSESSMENTS

When the candidate is ready for registration, the range of activities or work stages will be submitted for review plus detailed reports to demonstrate that all the outcomes, including the complexity and level of responsibility have been achieved. Mentors should conduct outcomes assessments at least twice annually to determine readiness for registration, or what additional activities need to be added to the training plan to achieve the outcomes.

POSSIBLE STATUTORY COUNCIL PLANNING TEMPLATES

To plan adequately it will be necessary to consider projects or tasks which must be carried out in the workplace, the level of responsibility the candidate should be working towards and the outcomes which must be developed per activity or task.

On the following pages simple Training Plan layouts will offer guidance on planning the candidate's work to ensure overall exposure to the phases of the project cycle or work stages and the various activities within each phase or stage. The activities suggested at the top of the table are those either suggested by, or required by the Statutory Council, and projects must be selected to address their requirements, including the achievement of the outcomes required.

The responsibilities, outcomes and plans covering each Statutory Council requirement follow.

ECSA – Training Plan

ACTIVITIES

The ECSA training plan should be composed of activities relevant to local government, selected from the activities outlined in the R-02 series of documents i.e. *activities include but are not limited to: design; planning; investigation and problem resolution; improvement of materials, components, systems or processes; implementation, manufacture or construction; engineering operations; maintenance; closure or disposal; project management; research, development and commercialisation*.

It will be noted in the suggested training plans shown in Table 4 and Table 5 that there are two activities marked with an asterisk (*). Implementation, manufacture or construction as listed above are typical activities in which candidates can gain experience in scheduling and managing resources and managing the implementation process in general. They may, however, gain similar experience in engineering operations and maintenance, if fully immersed in this role, and hence may gain their management and implementation experience performing operations and maintenance activities. Work for candidates may therefore be planned in the implementation phase or in operations and maintenance, if the activities are sufficiently demanding to develop the ECSA outcomes discussed below. They may therefore be responsible for one or the other, and the other column may be deleted if not required. Many candidates do, however, gain experience in both.

Although management experience will be gained when performing either of the activities discussed, it is important for mentors and supervisors to ensure that candidates are involved in engineering management, rather than simply administration, to achieve Outcome 4 below, and it is also important that candidates consider the funding aspects of projects i.e. considering costs and managing project budgets, hence two additional activities have been added to the training plan as cross-cutting activities.

When planning work for candidates in local government, typical tasks which they may perform under each activity heading are shown in Table 2. It is not expected that they perform all the tasks shown, but sufficient tasks should be assigned to ensure that candidates can meet the outcomes. The Implementation versus Operations and Maintenance activities are shown as Electives, but candidates must be assigned activities under one of the two activities, if not both.

Table 3: TYPICAL ACTIVITIES AND TASKS TO BE PERFORMED BY ENGINEERING CANDIDATES

Core Activities			Electives	
I. INVESTIGATION, PLANNING & RESEARCH Development Planning (IDP) Infrastructure Planning Conceptualisation Feasibility Research and Development	**II. DESIGN, DEVELOPMENT & OPTIMISATION** Investigation Needs Analysis Appropriate Technology Optimisation Reporting Detailed Design	**III. PROCUREMENT & TENDERING** Bill of Quantities Scope of Work and Specifications Tender Documents Advertisements Evaluation, Adjudication and Award Contract Documents	**IV. IMPLEMENTATION** Construction and Manufacturing Site Setup Scheduling and Programming Monitoring and Evaluation Measurement Quality Management Risk and Safety Mitigation Commissioning and Close-Out	**V. O&M** Operations Maintenance Optimisation/Upgrades/ Improvements Dispose/Decommission
Cross-Cutting Activities				
VI. ENGINEERING MANAGEMENT	Reports – Business Plans – Customer Relations and Stakeholder Engagement – Communication – Infrastructure Asset Management – Environmental Impact Assessment – Resources – Project Management – Legal and Regulatory – Manage Service Providers – Personal			
VII. FINANCE	Budgeting – Costing – Financial Management – Funding – Lifecycle Costing – Certification			

RESPONSIBILITY

The increasing degrees of responsibility shown in Table 1 are outlined in the ECSA training guideline document, R-04-P.

OUTCOMES

ECSA requires the following outcomes to be met:

1. Define, investigate and analyse *[level][1] engineering problems*
2. Design or develop solutions to *[level] engineering problems*
3. Comprehend and apply *[level]* knowledge: principles, specialist knowledge, jurisdictional and local knowledge
4. Manage part or all of one or more *[level] engineering activities*
5. Communicate clearly with others in the course of his or her engineering activities
6. Recognise and address the reasonably foreseeable social, cultural and environmental effects of *[level] engineering activities*
7. Meet all legal and regulatory requirements and protect the health and safety of persons in the course of his or her *[level] engineering activities*
8. Conduct engineering activities ethically
9. Exercise sound judgement in the course of *[level] engineering activities*
10. Be responsible for making decisions on part or all of *[level] engineering activities*
11. Undertake professional development activities sufficient to maintain and extend his or her competence

[1] The level of engineering problems and activities are: Complex for Engineers; Broadly defined for Technologists; Well-defined for Technicians

All of the above should be taken into account when planning future work for candidates.

COMPLEXITY

The ECSA R-02 suite of documents defines the degrees of complexity for each category of registration as follows:

- **Engineer** – complex work (see clauses 2.1.2 and 3.1.1 of R-02-PE)
- **Engineering technologist** – broadly defined work (see clauses 2.1.1 and 3.1.1 of R-02-PT)
- **Engineering technician** – well-defined work (see clauses 2.1.1 and 3.1.1 of R-02-PN)

Table 4 : EXAMPLE OF TRAINING PROGRAMME PLANNING SHEET FOR CIVIL OR ELECTRICAL ENGINEERING CANDIDATES IN THE PUBLIC SECTOR

Tick activities under relevant columns, per project. *Note: One or other activity may be adequate

Candidate name: _____ **Discipline:** _____

Organisation: _____

PROJECT Name & Number	PERIOD Start Date	Degree of Responsibility	Outcomes being worked towards	Investigation, Planning & Research	Design	Procurement & Contracts	*Construction/ Project Management	*O & M – Building & Industrial Services Reticulation	Engineering Management	Finance	Comments/description

Signature Candidate: _____ **Date:** _____

Signature Supervisor: _____ **Date:** _____

Signature Mentor: _____ **Date:** _____

Table 5 : EXAMPLE OF TRAINING PROGRAMME PLANNING SHEET FOR CHEMICAL OR MECHANICAL ENGINEERING

Tick activities under relevant columns, per project. *Note: One or other activity may be adequate

Candidate name: _____ Discipline: _____

Organisation: _____

PROJECT Name & Number	PERIOD Start Date	Degree of Responsibility	Outcomes Being Worked Towards	Investigation, Research & Development	Design	Procurement & Contracts	* Manufacturing, Erection & Commissioning	*O & M incl. Optimisation Process/Plant Operation	Engineering Management	Finance	Comments/description

Signature Candidate: _____ Date: _____

Signature Supervisor: _____ Date: _____

Signature Mentor: _____ Date: _____

SACPCMP – Training Plans

The activities and the outcomes are the same for Pr CPM and Pr CM. However, when planning the work for the respective categories the Recommended Identified Work of SACPMP must be scrutinized closely. The work stages, standard services and interpretation of the Project Management Knowledge Areas will give guidance regarding the type/complexity of work and the levels of responsibility, such as principal agent and/or principal consultant. The candidates must be assigned work and development activities in accordance with the guidelines.

Construction project manager

ACTIVITIES

The training plan should be composed of work stages listed below:

1. Project Initiation and Briefing – 20%
2. Concept and Feasibility – 20%
3. Design development – including Scope, Time, Cost, Quality, Communication, Risk – 40%
4. Tender Documentation and Procurement – including, Communication, Cost, Risk – 10%
5. Construction Documentation and Management – 5%
6. Project Close Out – 5%

RESPONSIBILITY

The degrees of responsibility suggested in Table 1 should be considered.

OUTCOMES

For registration as Pr CPM the emphasis is placed on Project Management Competencies both as Principal Consultant and Principal Agent. The candidate must demonstrate competence in understanding of the following nine project management knowledge areas:

1. Project Integration Management
2. Project Scope Management
3. Project Time Management
4. Project Cost Management
5. Project Quality Management
6. Project Human Resources Management
7. Project Communication Management
8. Project Risk Management including Health and Safety Issues
9. Project Procurement Management

Furthermore, the candidate must demonstrate the ability to perform the following, in accordance with the relevant SAQA problem solving level:

1. Investigate and solve problems
2. Implement solutions
3. Consider impacts
4. Behave ethically and act in accordance with the code of conduct
5. Continually develop professionally

COMPLEXITY

Essentially when registered, Construction Project Managers will be working at NQF 8 level. This means that the candidate will be expected to perform complex work as a principal consultant and principal agent. According to SAQA, the candidate will be required to demonstrate an ability to use a range of specialised skills to identify, analyse and address complex or abstract problems drawing systematically on the body of knowledge and methods appropriate to a field, discipline or practice when solving problems.

Additional project management complexity of work is prescribed in the identified work, and detailed in the standard services for each stage of work. These need to be consulted when activities are planned, and the candidate is assigned work.

Construction manager

ACTIVITIES

The training plan should be composed of work stages listed below:

1. Project Initiation and Briefing – 10%
2. Concept and Feasibility – 25%
3. Design development – including Scope, Time, Cost, Quality, Communication, Risk – 20%
4. Tender Documentation and Procurement – including, Communication, Cost, Risk – 10%
5. Construction Documentation and Management – 30%
6. Project Close Out – 5%

RESPONSIBILITY

The degrees of responsibility suggested in Table 1 should be considered.

OUTCOMES

For registration as Pr CM the emphasis is placed on the Construction Management Competencies and co-ordinating construction processes, as well as knowledge and understanding of construction contracts as a Principal Agent. The candidate must demonstrate competence in understanding of the following nine project management knowledge areas:

1. Project Integration Management
2. Project Scope Management
3. Project Time Management
4. Project Cost Management
5. Project Quality management
6. Project Human Resources Management
7. Project Communication Management
8. Project Risk Management including Health and Safety Issues
9. Project Procurement Management

Furthermore, the candidate must demonstrate the ability to perform the following, in accordance with the relevant SAQA problem solving level:

1. Investigate and solve problems
2. Implement solutions
3. Consider impacts

4. Behave ethically and act in accordance with the code of conduct
5. Apply sound judgement and make responsible decisions
6. Continually develop professionally

COMPLEXITY

Essentially when registered, Construction Managers will be working at NQF 8 level. This means that the candidate will be expected to perform complex work as a principal consultant and principal agent. According to SAQA, the candidate will be required to demonstrate an ability to use a range of specialised skills to identify, analyse and address complex or abstract problems drawing systematically on the body of knowledge and methods appropriate to a field, discipline or practice when solving problems.

Additional project management complexity of work is prescribed in the recommended identified work and detailed in the standard services for each stage of work. These need to be consulted when activities are planned and the candidate is assigned work.

Table 6: SACPCMP – TRAINING PLAN

Tick activities under relevant columns, per project.

Candidate name: _____ Discipline: _____

Organisation: _____

PROJECT, Name and Number	PERIOD Start Date	Degree of Responsibility	Outcomes being worked towards	1. Project Initiation & Briefing	2. Concept & Feasibility	3. Design development	4. Tender Documentation & Procurement	5. Construction Documentation & Management	6. Project Close Out	Comments/description

Signature Candidate: _____ Date: _____

Signature Supervisor: _____ Date: _____

Signature Mentor: _____ Date: _____

ACTIVITIES

The training plan should be composed of work stages listed below:

1. Inception – 5%
2. Concept and feasibility – 10%
3. Design development – 15%
4. Documentation and procurement – 20%
5. Construction – 35%
6. Close out – 10%
7. Specialisation – 5%

TASKS

The candidate must be competent to perform the following tasks:

1. Financial feasibilities
2. Cost advice and cost planning
3. Tendering methods and tender adjudication
4. Alternative contract documents and conditions
5. Escalation
6. Retention
7. Valuations

It is recommended that part of the candidate's experience should be in a QS Practice.

RESPONSIBILITY

The degrees of responsibility are defined in Table 1.

OUTCOMES

The candidate must demonstrate his/her competence in understanding all the essential functions that a professional quantity surveyor undertakes on a project from concept to completion, ability to communicate in a report format to a formal institution or client and his/her ability to solve problems.

Candidates must therefore achieve outcomes demonstrating that they are able to:

1. Investigate and solve problems
2. Implement solutions
3. Communicate
4. Consider impacts
5. Behave ethically
6. Apply sound judgement and make responsible decisions
7. Continually develop professionally

COMPLEXITY

The mentor must assess the level of competence learned and displayed on a regular basis to assess if the Candidate is ready to progress to the next level of competency and complexity. Such achievement (or shortfall) may influence the planning for subsequent tasks or phases. The assessment at the end of one

phase should form an input to the planning of the next and/or future phases. The process continues until the candidate is working at the level required for registration in each outcome and as a whole.

Essentially when registered, quantity surveyors will be working at NQF 8 level. This means that they will be expected to perform complex work which means that the candidate will be required to demonstrate an ability to use a range of specialised skills to identify, analyse and address complex or abstract problems drawing systematically on the body of knowledge and methods appropriate to a field, discipline or practice when solving problems.

Additional requirements

Candidates who do not have a 480 credit BSc Honours in Quantity Surveying, accredited by the SACQSP, will be required to undertake and pass the prescribed Professional Skills Modules (PSMs). There are 18 Professional Skills Modules (PSM). Candidates will be required to complete all 18 modules. The exams, assignments and tutorial must be factored into the candidate's training plan.

Table 7: SACQSP – QS TRAINING PLAN

Tick activities under relevant columns, per project.

Candidate name: _____ Discipline: _____

Organisation: _____

PROJECT, Name and Number	PERIOD Start Date	Degree of Responsibility	Outcomes being worked towards	1. Inception – 5%	2. Concept and feasibility – 10%	3. Design development – 15%	4. Documentation and procurement – 20%	5. Construction – 35%	6. Close out – 10%	7. Specialisation – 5%	Comments/description

Signature Candidate: _____ Date: _____

Signature Supervisor: _____ Date: _____

Signature Mentor: _____ Date: _____

SACNASP – Natural Science Professional Training Plan

An in-depth study was made of the registration requirements of SACNASP. There are 14 professional registration categories and some have sub-categories and categories of specialisation. It is difficult to determine the specific categories deployed in municipalities and to find generic activities, outcomes, recommended identified work and the nature of work in the Council guidelines. The ISDG management team will meet with the Council once they have narrowed down the categories of registration being considered.

Mentors need to consult the work experience requirements, guidelines, identification of work and scopes of work when developing workplace training plans

Two categories have been selected that are deemed to be relevant to local government and generic activities and outcomes have been developed as follows:

Water resource science

ACTIVITIES

The training plan should be composed of the following activities:

1. Atmospheric processes
2. Land-surface processes
3. Sub-surface processes
4. Biology and Zoology Processes
5. Water Bodies

RESPONSIBILITY

The degrees of responsibility are generic across all professions and are defined in Table 1.

OUTCOMES

The outcomes are only defined for registration in the professional category. The certified categories comprise mainly of activities, analysis and conclusions. The generic outcomes, for the professional category, are as follows:

1. Investigate
2. Analyse, manipulate and simulate
3. Draft guidelines
4. Consider impacts
5. Offer professional advice
6. Conduct research
7. Publish
8. Solve problems
9. Behave ethically in accordance with the code of conduct
10. Apply sound judgement and make responsible decisions
11. Continually develop professionally

COMPLEXITY

Essentially, when registered, **Professional Natural Scientists** will be working at NQF 8 level and above. According to SAQA, the candidate will be required to demonstrate an ability to use a range of specialised skills to identify, analyse and address complex or abstract problems drawing systematically on the body of knowledge and methods appropriate to a field, discipline or practice when solving problems.

Certificated Natural Scientists will be working at NQF 6 level. According to SAQA, the candidate will be required to demonstrate an ability to identify, analyse and solve problems in unfamiliar contexts, gathering evidence and applying solutions based on evidence and procedures appropriate to the field, discipline or practice when solving problems.

Mentors need to make a clear distinction in complexity of activities when developing work place training plans for each category of registration.

Table 8: SACNASP: Professional Water Resource Science

Tick activities under relevant columns, per project.

Candidate name: _____ Discipline: _____

Organisation: _____

PROJECT, Name and Number	PERIOD Start Date	Degree of Responsibility	Outcomes being worked towards	1. Atmospheric processes	2. Land-surface processes	3. Sub-surface processes	4. Biology and Zoology Processes	5. Water Bodies	Comments/description

Signature Candidate: _____ Date: _____

Signature Supervisor: _____ Date: _____

Signature Mentor: _____ Date: _____

Chemical science

ACTIVITIES

The training plan should be composed of the following activities:

1. Separation, isolation, analysis and characterisation of substances
2. Synthesis, manufacture, formulation and modification of compounds
3. Mixture of compounds
4. Handling and disposal of compounds
5. Generation, storage and application of energy

RESPONSIBILITY

The degrees of responsibility are generic across all professions and are defined in Table 1.

OUTCOMES

The outcomes are only defined for registration in the professional category. The certified categories comprise mainly of activities, analysis and conclusions. The generic outcomes, for the professional category, are as follows:

1. Identify and investigate
2. Analyse, manipulate and simulate
3. Consider impacts
4. Commissioning, operation, handling and disposal
5. Professional advice and inspection
6. Conduct Research
7. Publish
8. Solve problems
9. Behave ethically in accordance with the code of conduct
10. Apply sound judgement and make responsible decisions
11. Continually develop professionally

COMPLEXITY

Essentially, when registered, **Professional Natural Scientists** will be working at NQF 8 level and above. According to SAQA, the candidate will be required to demonstrate an ability to use a range of specialised skills to identify, analyse and address complex or abstract problems drawing systematically on the body of knowledge and methods appropriate to a field, discipline or practice when solving problems.

Certificated Natural Scientists will be working at NQF 6 level. According to SAQA, the candidate will be required to demonstrate an ability to identify, analyse and solve problems in unfamiliar contexts, gathering evidence and applying solutions based on evidence and procedures appropriate to the field, discipline or practice when solving problems.

Mentors need to make a clear distinction in complexity of activities when developing work place training plans for each category of registration.

Table 9: SACNASP: Professional Scientist Chemical Science

Tick activities under relevant columns, per project.

Candidate name: _____ Discipline: _____

Organisation: _____

PROJECT, Name and Number	PERIOD Start Date	Degree of Responsibility	Outcomes being worked towards	1. Separation, isolation, analysis & characterisation of substances	2. Synthesis, manufacture, formulation and modification of compounds	3. Mixture of compounds	4. Handling and disposal of compounds	5. Generation, storage and application of energy	Comments/description

Signature Candidate: _____ Date: _____

Signature Supervisor: _____ Date: _____

Signature Mentor: _____ Date: _____

ACTIVITIES

As per Act No. 40 of 1984, the training plan should include a variety of work. These are described in the 2011 *'Notes for guidance for GISc Technicians'* published by PLATO/SAGC as follows:

Compulsory training (80days)

i. IT Skills - 10
ii. Data Collection and Capture – 15
iii. Data Manipulation – 15
iv. Reproduction Procedures – 5
v. Spatial Modelling – 20
vi. Map Production – 15

Additional training (140 days)

a. IT Skills Development
b. Data Collection, Capture and Processing
c. Data Manipulation
d. Spatial Modelling
e. Photogrammetric Compilation
f. Image Processing
g. Map Production

Where **compulsory** items may not be achieved in the local government environment, candidates should be seconded to specialist service providers to gain the appropriate experience. When **additional** items may not be achieved in the local government environment, these columns may be deleted from the training plan, but it is essential that candidates spend at least 140 days on the remaining activities selected.

RESPONSIBILITY

The degrees of responsibility as outlined in Table 1 should be considered.

OUTCOMES

1. Investigate, analyse and solve problems considering client requirements
2. Implement solutions
3. Manage resources and finances
4. Communicate including write specifications, interview and liaise with clients and stakeholders and write proposals and reports
5. Consider impacts
6. Behave ethically
7. Apply sound judgement and make responsible decisions
8. Continually develop professionally

COMPLEXITY

GISc Technicians will be working at NQF 6 level. According to SAQA, the candidate will be required to demonstrate an ability to identify, analyse and solve problems in unfamiliar contexts, gathering evidence and applying solutions based on evidence and procedures appropriate to the field, discipline or practice when solving problems.

Table 10: SAGC – GISc TECHNICIAN TRAINING PLAN

Tick activities under relevant columns, per project.

Candidate name: _____ Discipline: _____

Organisation: _____

PROJECT, Name and Number	PERIOD Start Date	Degree of Responsibility	Outcomes being worked towards	1. IT Skills - 10	2. Data Collection and Capture – 15	3. Data Manipulation – 15	4. Reproduction Procedures – 5	5. Spatial Modelling – 20	6. Map Production – 15	a. IT Skills Development	b. Data Collection, Capture & Processing	c. Data Manipulation	d. Spatial Modelling	e. Photogrammetric Compilation	f. Image Processing	g. Map Production	Comments/description

Signature Candidate: _____ Date: _____

Signature Supervisor: _____ Date: _____

Signature Mentor: _____ Date: _____

SAGC – GISc Technologist Training Plan

ACTIVITIES

As per Act No. 40 of 1984, the training plan should include a variety of work. These are described in the 2011 *'Notes for guidance for GISc Technologist'* published by PLATO/SAGC as follows:

Compulsory training (120 Days)

i. Data collection and capture – 20
ii. Data manipulation – 15
iii. Reproduction procedures – 5
iv. Database and spatial modelling – 15
v. Map production – 20
vi. Spatial statistics and interpolation – 5
vii. Spatial analysis – 10
viii. Remote sensing and photogrammetry – 10
ix. Project Management – 20

Additional Training (100 Days)

a. Data collection, capture and processing
b. Spatial Data Modelling
c. Spatial Information management, manipulation and recovery
d. Spatial data quality assessment and error management
e. Spatial Statistics and Analysis
f. Project management
g. Remote sensing and Image Processing

Where **compulsory** items may not be achieved in the local government environment, candidates should be seconded to specialist service providers to gain the appropriate experience. When **additional** items may not be achieved in the local government environment, these columns may be deleted from the training plan, but it is essential that candidates spend at least 100 days on the remaining activities selected.

RESPONSIBILITY

The degrees of responsibility as outlined in Table 1 should be considered.

OUTCOMES

1. Investigate, analyse and solve problems considering client requirements
2. Implement solutions
3. Manage resources and finances
4. Communicate including write specifications, interview and liaise with clients and stakeholders and write proposals and reports
5. Consider impacts
6. Behave ethically
7. Apply sound judgement and make responsible decisions
8. Continually develop professionally

COMPLEXITY

GISc Technologist will be working at NQF 7 level. According to SAQA, the candidate will be required to demonstrate an ability to identify, analyse, evaluate, critically reflect on and address complex problems, applying evidence-based solutions and theory-driven arguments when solving problems.

Table 11: SAGC – GISc TECHNOLOGIST TRAINING PLAN

Tick activities under relevant columns, per project.

Candidate name: _____ Discipline: _____

Organisation: _____

PROJECT Name and Number	PERIOD Start Date	Degree of Responsibility	Outcomes being worked towards	1. Data collection and capture	2. Data manipulation	3. Reproduction procedures	4. Database and spatial modelling	5. Map production	6. Spatial statistics and interpolation	7. Spatial analysis	8. Remote sensing and photogrammetry	9. Project Management	a. Data collection, capture and processing	b. Spatial Data Modelling	c. Spatial Information management, manipulation and recovery	d. Spatial data quality assessment and error management	e. Spatial Statistics and Analysis	f. Project management	g. Remote sensing and Image Processing	Comments/description

Signature Candidate: _____ Date: _____

Signature Supervisor: _____ Date: _____

Signature Mentor: _____ Date: _____

ACTIVITIES

As per Act No. 40 of 1984, the training plan should include a variety of work. These are described in the 2011 *'Notes for guidance for Professional GISc Practitioner'* published by PLATO/SAGC as follows:

Compulsory training (120 Days)

i. Data collection and capture – 20
ii. Data manipulation – 15
iii. Reproduction procedures – 5
iv. Database and spatial modelling – 15
v. Map production – 20
vi. Spatial statistics and interpolation – 5
vii. Spatial analysis – 10
viii. Remote sensing and photogrammetry – 10
ix. Project management – 20

Additional Training (100 Days)

a) Data collection, capture and processing
b) Spatial Data Manipulation
c) Map Production
d) Databases and Spatial Data Modelling
e) Spatial Statistics, Interpolation and Analysis
f) Project management
g) Remote sensing and Image Processing
h) Spatial information management, manipulation and recovery
i) Spatial data quality assessment and error management

Where **compulsory** items may not be achieved in the local government environment, candidates should be seconded to specialist service providers to gain the appropriate experience. When **additional** items may not be achieved in the local government environment, these columns may be deleted from the training plan, but it is essential that candidates spend at least 100 days on the remaining activities selected.

RESPONSIBILITY

The degrees of responsibility as outlined in Table 1 should be considered.

OUTCOMES

1. Investigate, analyse and solve problems considering client requirements
2. Implement solutions
3. Manage resources and finances
4. Communicate including write specifications, interview and liaise with clients and stakeholders and write proposals and reports
5. Consider impacts
6. Behave ethically
7. Apply sound judgement and make responsible decisions
8. Continually develop professionally

COMPLEXITY

Professional GISc Practitioner will be working at NQF 8 level. According to SAQA, the candidate will be required to demonstrate an ability to use a range of specialised skills to identify, analyse and address complex or abstract problems drawing systematically on the body of knowledge and methods appropriate to a field, discipline or practice when solving problems.

Table 12: SAGC – PROFESSIONAL GISc PRACTITIONER TRAINING PLAN

Tick activities under relevant columns, per project.

Candidate name: _____ Discipline: _____

Organisation: _____

PROJECT Name and Number	PERIOD Start Date	Degree of Responsibility	Outcomes being worked towards	1. Data collection and capture	2. Data manipulation	3. Reproduction procedures	4. Database and spatial modelling	5. Map production	6. Spatial statistics and interpolation	7. Spatial analysis	8. Remote sensing & photogrammetry	9. Project management	a. Data collection, capture & processing	b. Spatial Data Manipulation	c. Map Production	d. Databases and Spatial Data Modelling	e. Spatial Stats, Interpolation & Analysis	f. Project management	g. Remote sensing and Image Processing	h. Spatial information management, manipulation and recovery	i. Spatial data quality assessment & error management	Comments/description

Signature Candidate: _____ Date: _____

Signature Supervisor: _____ Date: _____

Signature Mentor: _____ Date: _____

Candidate
Organisation
Qualification

No	Project ID	Project Description
1A		Stormwater: Uitenhage Setting out levels
2A		Traffic Engineering Traffic Circle Design
3A	20050097	Bulk Water Supply Sche Design Report
3B	20050097	Bulk Water Supply Sche Filters
3C	20050097	Bulk Water Supply Sche Pump Station
3D	20050097	Bulk Water Supply Sche Rising Main
3E	20050097	Bulk Water Supply Sche Reservoir
3F	20050097	Bulk Water Supply Sche Construction Site Super
3G	20050097	Bulk Water Supply Sche Procurement of Phase 1
3H	20050097	Bulk Water Supply Sche Commissioning Phase 1
4A		Proposed Witteklip Deve Reticulation Network
4B		Proposed Witteklip Deve Specifications & BoQ
4C		Proposed Witteklip Deve Tender
5A		Contra-Lab Soil Tests