ENSURING THE
EXPERTISE TO GROW
SOUTH AFRICA

Discipline Specific Training Guide (DSTG) for Registration as a Professional Engineer in Electrical Engineering

R-05-ELE-PE

REVISION 2: 16 November 2017

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ECSA

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1. BACKGROUND: SYSTEM DOCUMENTS FOR ECSA REGISTRATION

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

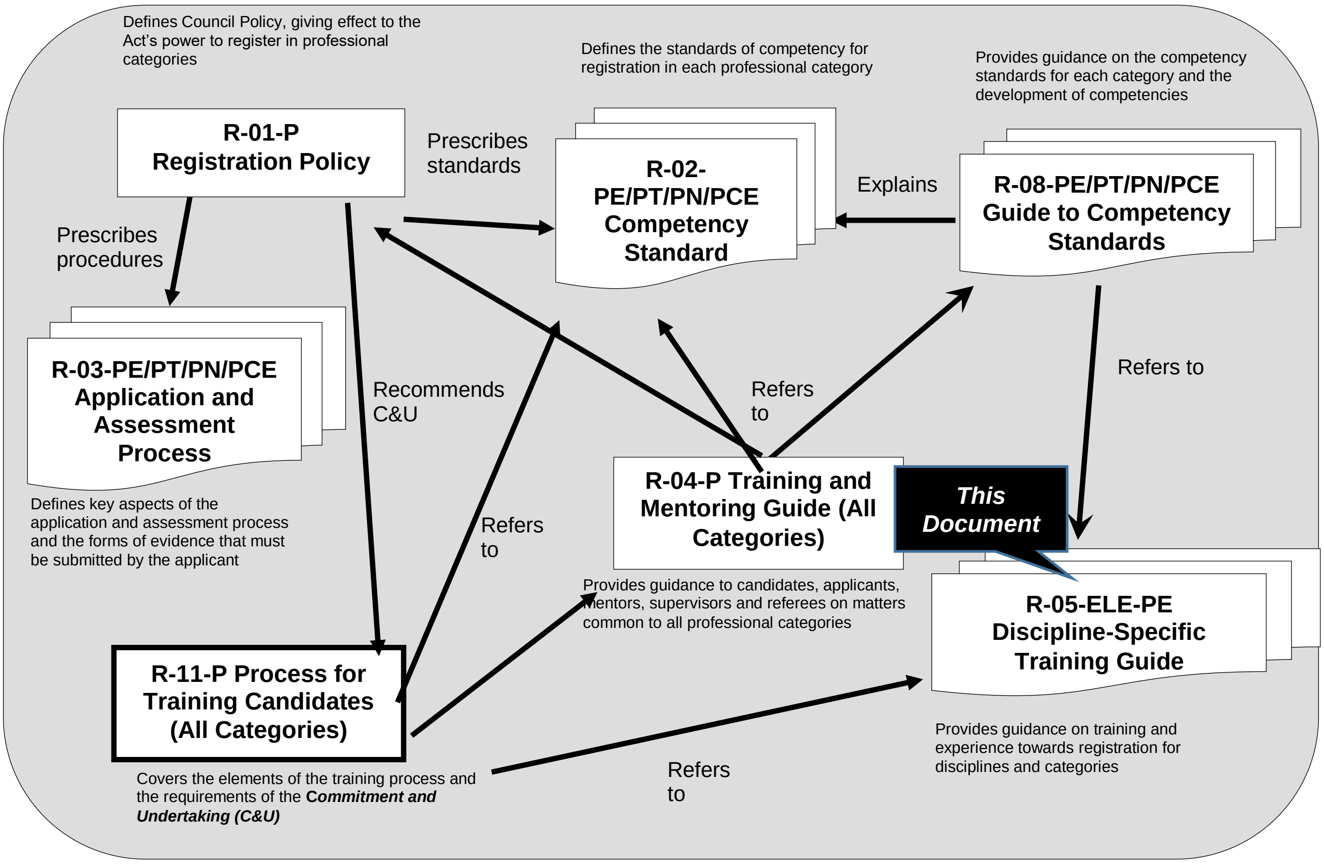

Figure 1: Documents defining the ECSA Registration System

2. PURPOSE

All persons applying for registration as Professional Engineers are expected to demonstrate the competencies specified in document R-02-PE through work performed at the prescribed level of responsibility, irrespective of the trainee's discipline.

The document R-02-PE supplements the generic *Training and Mentoring Guide* (document R-04-P) and the *Guide to the Competency Standards for Professional Engineers* (document

R-08-PE).

In document R-04-P, attention is drawn to the following sections:

7.3.2 Duration of training and period of time working at level required for registration

7.3.3 Principles of planning, training and experience

7.3.4 Progression of training programme

7.3.5 Documenting training and experience

7.4 Demonstrating responsibility

The second document (document R-08-P) provides a high-level, outcome-by-outcome understanding of the competency standards that form an essential basis for this Discipline-Specific Training Guide (DSTG).

This guide and the documents R-04-P and R-08-PE are subordinate to the Policy on Registration (document R-01-P), the Competency Standard (document R-02-PE) and the application process definition (document R-03-PE).

3. AUDIENCE

The DSTG is directed towards candidates and their supervisors and mentors in the discipline of Electrical Engineering, which comprises bio-engineering, computer engineering, control engineering, electronic engineering, power engineering, software engineering, information engineering and telecommunications engineering and others. The guide is intended to support a programme of training and experience through incorporating elements of good practice.

The guide applies to persons who have

- completed the tertiary educational requirements in Electrical Engineering
  - by obtaining an accredited B.Eng.-type qualification from a recognised tertiary university in South Africa,
  - by acquiring an ECSA-accredited qualification or a Washington Accord recognised qualification, or
  - through evaluation/assessment;

- registered with the ECSA as a Candidate Engineer; and/or
- embarked on a process of acceptable training through a registered Commitment and Undertaking (C&U) programme that is under the supervision of an assigned mentor guiding the professional development process at each stage.

4. PERSONS NOT REGISTERED AS A CANDIDATE AND/OR NOT TRAINED UNDER COMMITMENT AND UNDERTAKING

Irrespective of the development path followed, all applicants for registration must present the same evidence of competence and be assessed against the same standards. Application for registration as a Professional Engineer is permitted without being registered as a Candidate Engineer or without training through a C&U candidacy programme. Mentorship and adequate supervision are, however, key factors in effective development to attain the level required for registration.

If the employer of the trainee does not offer C&U, the trainee must establish the level of mentorship and supervision that the employer is able to provide. In the absence of an internal mentor, the services of an external mentor should be secured. The Voluntary Association for the discipline may be consulted for assistance in locating an external mentor. A mentor must keep abreast of all stages of the development process.

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

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

5. ORGANISING FRAMEWORK FOR OCCUPATIONS

Electrical Engineering (Organising Framework for Occupations (OFO) 215101)

Electrical Engineers form a collective group of engineers who design, advise, plan, direct and conduct research on the construction and operation of electronic, electrical and telecommunications systems, computer and software systems, components, motors and equipment. Electrical Engineers organise and establish control systems to monitor the performance and safety of electrical and electronic components, assemblies and systems.

The functions of Electrical Engineers include the planning, design, construction, operation and maintenance of materials, components, plants and systems for generating, transmitting, distributing and utilising electrical energy. The field of Electrical Engineering encompasses electronic devices, apparatus and control systems for industrial systems together with biomedical devices, robotics and consumer products. Computing, communication and software for critical applications, instrumentation and control of processes are addressed through the application of electrical, electromagnetic and information engineering sciences.

Within the broad collective field of Electrical Engineering, engineers generally practise within their areas of speciality.

5.1 Electrical Power Engineering

Electrical Power Engineering encompasses electrical systems, components, motors and equipment as well as electrical engineering materials, products and processes.

5.2 Electronic Engineering

Electronic Engineering covers electronic systems, electronic engineering materials, products and processes.

5.3 Telecommunications Engineering

Telecommunications Engineering is a broad specialisation of Electrical Engineering that encompasses the design, construction and management of systems that carry out the transmission, processing and storage of information as electrical or optical signals and the control services based on this capability.

5.4 Computer and Software Engineering

Computer and Software Engineering addresses the relationships and the interactions between software, hardware and external systems in solving engineering problems. Computer Engineering concentrates on the ways in which computing ideas are mapped into working physical systems. Computer Engineering rests on the intellectual foundations of Electrical Engineering, computer science, the natural sciences and mathematics.

5.5 Alternative Energy Engineering

Alternative Energy Engineering is a broad specialisation of Electrical Engineering that encompasses the design, construction and management of systems that carry out the generation, transmission and processing of alternative sources of electrical energy.

Engineers also practise combinations of the above specialties and work in areas that encompass other disciplines, for example, Mechatronics Engineering, which involves robotic, prosthesis and process control.

5.6 Electrical Power Engineers

Electrical Power Engineers conduct research and advise on the design and direct the construction and the operation of electrical systems and components. Electrical Power Engineers advise on and direct the functioning, maintenance and repair of motors and equipment and study and advise on technological aspects of electrical engineering materials, products and processes.

Typical tasks that an Electrical Power Engineer may undertake include

- conducting research and developing new or improved theories and methods relating to Electrical Power Engineering;
- advising on and designing power stations and systems that generate, transmit and distribute electrical power;

- specifying the instrumentation, measurement and control of equipment for the monitoring and control of electrical-generation, transmission and distribution systems;
- supervising, controlling, developing and monitoring the operation and maintenance of electrical-generation, transmission and distribution systems;
- advising on and designing systems for electrical motors, electrical traction and other equipment such as electrical domestic appliances;
- specifying electrical installation and application in industrial structures and other buildings and objects;
- establishing control standards and procedures to monitor performance and safety of electrical-generating and distribution systems, motors and equipment;
- determining manufacturing methods for electrical systems and maintaining and repairing existing electrical systems, motors and equipment; and
- designing and developing electrical apparatus.

Practising Electrical Power Engineers may specialise as one or more of the following:

- Control Engineer
- Electrical Design Engineer
- Electrical Engineer (Mines)
- Electrical Power Generation Engineer
- Electromechanical Engineer
- Illumination Engineer
- Power Distribution Engineer
- Power Systems Engineer
- Power Transmission Engineer
- Power System Design Engineer
- Railway Signal Engineer
- Signalling and Communications Engineer
- Control and Instrumentation Engineer
- Power Product Sales Engineer
- Power Electronics Engineer
- Power Systems Protection Engineer

- Plant and Factory Engineer
- Mining Electrical Engineer
- Electrical Drive Engineer
- Energy Management Engineer

5.7 Electronics Engineers

Electronics Engineers conduct research and advise on the design and direct the construction, maintenance and repair of electronic systems. Electronics Engineers study and advise on the technological aspects of electronic engineering materials, products and processes.

Typical tasks that an Electronics Engineer may undertake include

- conducting research and developing new or improved theories and methods relating to Electronics Engineering;
- advising on and designing electronic devices or components, circuits, semi-conductors and systems;
- specifying production or installation methods, materials and quality standards and directing production or installation of electronic products and systems;
- supervising, controlling, developing and monitoring the operation and maintenance of electronic equipment and systems;
- establishing control standards and procedures to ensure efficient functioning and safety of electronic systems and equipment;
- organising and directing the maintenance and repair of existing electronic systems and equipment;
- designing electronic circuits and components for use in fields such as aerospace, guidance and propulsion control, acoustics or instruments and controls;
- determining manufacturing methods for electronic systems and maintaining and repairing existing electronic systems and equipment;
- researching and advising on radar, telemetry and remote-control systems, microwaves and other electronic equipment;
- designing and developing signal processing algorithms and implementing these through appropriate choice of hardware and software;

- developing apparatus and procedures to test electronic components, circuits and systems;
- designing, specifying and implementing Control and Instrumentation of plants and processes;
- designing, specifying, controlling and monitoring of equipment for fire detection and safety (safety integrity level – SIL rating) in plants and factories;
- controlling robotics and processes of manufacturing plants; and
- increasing energy efficiency of photovoltaic (PV) cells.

Practising Electronics Engineers may specialise as one or more of the following:

- Communications Engineer (Army)
- Mechatronics Engineer
- Electronics Designer
- Information Engineer
- SCADA and Control Engineer
- Instrumentation Engineer
- Television Engineer
- Biomedical Engineer
- Clinical Engineer
- Fire and Safety Engineer
- Rail Network Control
- Aircraft Electronic Systems Engineer
- Electronic Warfare Engineer

5.8 Telecommunications Engineers

Telecommunications Engineers conduct research and advise on the design and direct the construction, maintenance and repair of telecommunication systems and equipment. Telecommunications Engineers study and advise on the technological aspects of the materials products or processes relating to Telecommunications Engineering. Telecommunications Engineers plan, design and monitor complex telecommunication networks and associated broadcasting equipment.

Typical tasks that a Telecommunications Engineer may undertake include

- conducting research and developing new or improved theories and methods relating to Telecommunications Engineering;
- advising on and designing telecommunication devices or components, systems, equipment and distribution centres;
- specifying production or installation methods, materials, quality and safety standards and directing production or installation of telecommunication products and systems;
- supervising, controlling, developing and monitoring the operation and maintenance of telecommunication systems, networks and equipment;
- determining the manufacturing methods for telecommunication systems and maintaining and repairing existing telecommunication systems, networks and equipment;
- organising and directing the maintenance and repair of existing telecommunication systems, networks and equipment;
- planning and designing communication networks based on wired, fibre-optic and wireless communication media;
- designing and developing signal processing algorithms and implementing these through appropriate choice of hardware and software;
- designing telecommunication networks and radio and television distribution systems, including both cable transmission and over-the-air broadcasting.

Practising Telecommunications Engineers may specialise as one or more of the following:

- Broadcast Engineer
- Digital Signal Processing Designer
- Communications Engineer
- Fibre Optics Engineer
- Radio Frequency Design Engineer
- Radar Engineer
- Radio Engineer
- Radio and Telecommunications Engineer
- Mobile Radio Engineer

- Satellite Transmission Engineer
- Processing and Communications Systems Engineer
- Consulting Communications Engineer
- Specialist Telecommunications (ICT) Engineer
- Consulting Telecommunications Engineer
- Network Planning Engineer
- Microwave Engineer

5.9 Computer and Software Engineers

Computer and Software Engineers conduct research and advise on the design and direct the construction, maintenance and repair of computer-based systems, software and equipment. Computer and Software Engineers study and advise on the technological aspects of computer-based systems, software, products and processes. Computer and Software Engineers perform system analyses on computer-based systems and software and specify the systems required. Computer and Software Engineers plan, design and monitor complex computer-based systems, software, networks and associated communication equipment.

Typical tasks that a Computer Engineer may undertake include

- conducting research and developing new or improved theories and methods relating to Computer and Software Engineering;
- advising on and designing computer-based systems or components, systems equipment, software and distribution centres;
- specifying production or installation methods, specifying materials, quality and safety standards and directing production and installation of computer-based products, software and systems;
- supervising, controlling, developing and monitoring the operation and maintenance of computer-based systems, software, networks and equipment;
- organising and directing the maintenance and repair of existing computer-based systems, programmes and equipment;
- researching and advising on computer-based equipment and software;

- planning and designing computer-based communication networks based on wired, fibre optic and wireless communication media and ultra-high-speed data networks;
- performing system analyses together with designing and developing complex computer-based systems;
- implementing these computer-based systems through appropriate choice of hardware and managing the development of the necessary software; and
- determining manufacturing methods for computer-based systems, networks and equipment.

Practising Computer Engineers may specialise as one or more of the following:

- Computer Engineer
- Computer System Analyst Engineer
- Computer System Design Engineer
- Computer Communication Specialist Engineer
- Computer Network Design Engineer
- Computer Network Sales Engineer
- Software Engineer
- Systems Engineer

5.10 Alternative Sources of Energy Engineers

Alternative Sources of Energy Engineers conduct research and advise on the design and direct the construction, maintenance and repair of renewable energy sources such as wind, solar and wave. These engineers study and advise on the technological aspects of computer-based systems and software products and processes. The engineers perform system analyses on computer-based system requirements and software and specify the systems required. Alternative Energy Engineers plan, design and monitor complex computer-based systems, software, networks and the associated communication equipment.

Typical tasks that an Alternative Energy Engineer may undertake include

- conducting research and developing new or improved theories and methods relating to Alternative Energy Engineering;
- advising on and designing computer-based systems or components, systems equipment, software and distribution centres;
- specifying production or installation methods, specifying materials and quality and safety standards and directing the production and installation of computer-based products, software and systems;
- supervising, controlling, developing and monitoring the operation and maintenance of alternative energy systems, software, networks and equipment;
- organising and directing the maintenance and repair of existing computer-based systems, programmes and equipment;
- researching and advising on alternative energy equipment and software;
- planning and designing computer-based communication networks based on wired, fibre optic and wireless communication media and ultra-high-speed data networks;
- performing system analyses together with designing and developing complex computer-based systems;
- implementing these computer-based systems through appropriate choice of hardware and managing the development of the necessary software; and
- determining manufacturing methods for computer-based systems and directing the maintenance and repair of existing computer-based systems, networks and equipment.

Practising Alternative Energy Engineers may specialise as one or more of the following:

- Computer Engineer
- Control and Instrumentation Engineer
- Energy Management Engineer
- Electrical Design Engineer
- Electrical Power Generation Engineer
- Electromechanical Engineer
- Power Distribution Engineer
- Power Systems Engineer
- Power Transmission Engineer

- Power Engineer
- Computer System Analyst Engineer
- Computer System Design Engineer
- Computer Communication Specialist Engineer
- Computer Network Design Engineer
- Computer Network Sales Engineer
- Software Engineer
- Systems Engineer
- Others

The DSTG guide initially presents information that is relevant to all Candidate Engineers whose areas are in the broad field of Electrical Engineering. Information specific to sub-disciplines is provided in the subsequent sections. Special considerations in regard to training in different environments, for example, consulting and contracting, are also given.

6. NATURE AND ORGANISATION OF THE INDUSTRY

6.1 Investigation

Electrical Engineers may be employed in either the private or the public sector.

In the private sector, Electrical Engineers are typically involved in consulting and contracting or employed by manufacturers of equipment or suppliers of services for the engineering sectors. Engineering consultants are concerned with planning, designing, documenting and supervising the construction of projects on behalf of clients. Engineering contractors are responsible for project implementation, and their activities include planning, construction and labour and resource management. Electrical Engineers working in supply or manufacturing companies are primarily involved in production, supply and quality control but could also be involved in research and development.

The public sector is responsible for service delivery although in some departments, design and construction is also carried out. Electrical Engineers are required at all levels of the public sector, including national, provincial and local government level, state-owned enterprises and public utilities. The public sector is largely engaged in planning, specifying and overseeing the implementation, operation and maintenance of infrastructure. Extensions of the public sector include tertiary academic institutions and research organisations.

There may be employment situations in which the in-house opportunities are not sufficiently diverse to develop all the competencies required for the groups noted in the document R-02-PE. For example, opportunities to develop problem-solving competence (designing and developing solutions) and to manage engineering activities (constructing and implementing solutions) may not be available to the candidate. In such cases, employers are encouraged to establish a secondment system.

It is fairly common practice that should an organisation be unable to provide training in certain areas, secondments are arranged with other organisations so that candidates are able to develop all the competencies required for registration. These secondments are usually of a reciprocal nature and as a result, both employers and the respective employees mutually benefit. Secondments between consultants and contractors and between the public and private sectors should be made possible.

6.2 Location of training in overall engineering life cycle and functions performed

The area in which Electrical Engineers work generally follows the conventional stages of the life cycle of the project or product. These stages are as follows:

- research and development of new products or systems or advancement of solutions to system problems or system obsolescence;
- system or product design to establish a new system or product, to solve system or product problems, to achieve a particular desired result or to select equipment for a particular purpose;
- operation, maintenance and support of the system, network or product;
- Project Engineering to install, test and commission the necessary equipment or system to achieve the desired result; and
- decommissioning of the system or network.

Candidates are not expected to change their places of employment in order to work in all the areas listed above. Candidates, however, must ensure that in the area in which they are employed, tasks are undertaken that provide experience in all the generic engineering competencies of problem-solving, implementation and operation, risk and impact mitigation and management of engineering activities.

A schema is presented In the Appendix below that indicates the functions in which a candidate should be competent when carrying out the various phases of a project:

- solving problems based on engineering and contextual knowledge;
- implementing and operating engineering projects, systems, products and processes;
- mitigating risk and impact; and
- managing engineering activities.

Three levels of description are given. In regard to the third level, the description is largely independent of the discipline. Discipline specifics may be included as fourth and fifth levels as required. These specifics would include the types of evidence of performance that would be appropriate at each line and record-keeping of the evidence.

6.3 Process design

Process Design, the process followed during the life cycle of a project, must include System Engineering. Candidates must include the cycles in which they have been involved and their contributions.

6.4 Risk and impact mitigation

Risk and impact mitigation must include the probability and impact of all the risks connected with the project. The focus areas of the project must be indicated on a risk matrix. Mitigation must include the time of mitigation and the person who is responsible. Solutions should include a Plan

A and a Plan B. The Risk document must be a live document through the life cycle of a project and must include the following:

- Technical risk
- Environmental risk
- Quality risk
- Commercial risk (Late or wrong deliveries of equipment)
- Schedule risk
- Social risk
- Construction risk

6.5 Implementation/Commissioning

Project Engineers must install, test and commission the necessary equipment or system for the desired result. This process must include all actions taken during construction (quality). This can refer to a project quality plan. During commissioning, candidates must clearly indicate their contributions. Stated contributions can also refer to the commissioning plan.

6.6 Production

State the requirement of the project in terms of delivery. Refer to the initial production requirements for the project. Did you obtain these results and if not, why were you unsuccessful?

6.7 Operation and maintenance

What are the stated operation requirements of the project? State the percentage of the plant that is available for implementing the project. State the maintenance philosophy and substantiate.

7. DEVELOPING COMPETENCY: ELABORATING ON SECTIONS IN THE GUIDE RELATING TO COMPETENCY STANDARDS (DOCUMENT R-08-PE)

7.1 Contextual knowledge

Candidates are expected to be aware of the Voluntary Associations that are applicable to the Electrical Engineering profession and the functions and services rendered by the associations to members.

7.2 Functions performed

Special considerations in the discipline, sub-discipline or specialty must be given to the competencies specified in the following groups:

- Knowledge-based problem-solving (this should be a strong focus)
- Management and communication
- Identifying and mitigating the impacts of engineering activity
- Judgement and responsibility
- Independent learning

It is very useful to measure the progression of a candidate's competency by making use of the Degree of Responsibility, the Problem-Solving and the Engineering Activity scales as specified in document R-02-PE.

The Appendix below has been developed against the Degree of Responsibility Scale. Activities should be selected to ensure that the candidate reaches the required level of competency and responsibility.

It should be noted that a candidate working at Responsibility Level E carries responsibility equivalent to that of a registered person except that the candidate's supervisor is accountable for the candidate's recommendations and decisions.

7.3 Statutory and regulatory requirements

Candidates are expected to have a working knowledge of the following regulations and Acts and how this legislation affects their working environment:

- Engineering Profession Act, 2000 (Act No. 46 of 2000), including the ECSA rules and Code of Conduct
- Occupation Health and Safety Act, 1993 (Act No. 85 of 1993) as amended by Act No. 181 of 1993 (latest revision used)
- Wiring Code – SANS 10142
- Building Regulations – National Building Regulations and Building Standards Act, 1977 (Act No. 103 of 1977) as amended by Act No. 49 of 1995, SANS 10400
- Factory Regulations
- Machinery and Works Regulations
- Labour Relations Act, 1995 (Act No. 66 of 1995)
- Environment Conservation Act, 1989 (Act No. 73 of 1989) as amended by Act No. 52 of 1994 and Act No. 50 of 2003
- Mine Health and Safety Act, 1996 (Act No. 29 of 1996)
- Industry-specific work instructions and specifications
- SANS applicable specifications

Other Acts not listed here may also be pertinent to a candidate's work environment. Candidates will be expected to have a basic knowledge of the applicable Acts.

7.4 Desirable formal learning

The following list of formal learning activities is by no means extensive and is simply a sample of useful courses.

- Project Management
- Conditions of Contract \ Value Engineering – NEC, JBCE, etc.
- Standards
- Specifications

- Preparation of specifications
- Negotiation Skills
- Engineering Finance
- Risk Analysis
- Quality Systems
- Occupation Health and Safety
- Discipline-specific courses
- Energy Efficiency
- Electrical Tariffs
- Maintenance Engineering
- Environment Impacts
- Management
- Report Writing
- Planning Methods
- System Engineering
- Industrial Relations
- Public Speaking

8. PROGRAMME STRUCTURE AND SEQUENCING

8.1 Best practices

There is no ideal training programme structure or unique sequencing that constitutes best practice. The training programme for each candidate depends on the available work opportunities assigned to the candidate by the employer.

It is suggested that candidates work with their mentors to determine appropriate projects in order to gain exposure to elements of the asset life cycle. In addition, candidates need to ensure that their designs are constructible, operable and are designed considering life cycle costing and long-term sustainability. A regular reporting structure with suitable recording of evidence of achievement against the competency outcomes and responsibility needs to be in place.

The training programme should be such that the candidate progresses through the levels of work capability (described in section 7.3.4 of the document R-04-P) to ensure that by the end of the training period, the candidate exhibits Responsibility Level E and is able to perform individually and as a team member at the level of problem-solving and engineering activity required for registration.

Value Improved Practices (VIPs) are out-of-the-ordinary practices used to improve cost, schedule, and/or reliability of capital construction projects. Value Improved Practices are

- used primarily during front-end-loading;
- formal, documented practices involving a repeatable work process; and
- predominantly facilitated by specialists from outside the project team.

Examples of VIPs are as follows:

- Technology selection
- Process simplification
- Classes of facility quality
- Waste minimisation
- Energy optimisation
- Process reliability modelling
- Customisation of standards and specifications
- Predictive maintenance
- Design to capacity
- Value engineering
- Constructability

8.2 Realities

Section 10 of document R-08-PE adequately describes what is expected of persons whose formative developments have not followed conventional paths, for example, academics, researchers and specialists.

8.3 Generalists, specialists, researchers and academics

The overriding consideration is that irrespective of the route followed, the applicant must provide evidence of competency against the standard.

8.4 Multi-disciplinary exposure

Interface management between various disciplines needs to be formalised. Details of signed-off interface documents between different disciplines are essential.

8.5 Orientation requirements

The following orientation requirements should be undertaken, as indicated in Appendix: Training Elements:

- Introduction to company safety regulations
- Company code of conduct
- Company staff code and regulations
- Typical functions and activities within the company
- Hands-on experience and orientation in each of the major company divisions

8.6 Moving into or changing candidacy training programmes

The DSTG assumes that the candidate enters a programme after graduation and continues with the programme until ready to submit an application for registration. The guide also assumes that the candidate is supervised and mentored by persons who meet the requirements stated in section 7.2 of document R-04-P. In the case of a person changing from one candidacy programme to another or moving into a candidacy programme from a less structured environment, it is essential that the following steps are completed:

- The candidate must complete the Training and Experience Summary (TES) and the Training and Experience Reports (TERs) for the previous programme or the unstructured experience. In regard to the latter, it is important to reconstruct the experience as accurately as possible. The TERs must be signed off by the relevant supervisor or mentor.

- On entering the new programme, the mentor and supervisor should review the candidate's development while being mindful of the past experience and the opportunities and requirements of the new programme. At minimum, the mentor and supervisor should plan the next phase of the candidate's programme.

REVISION HISTORY

Revision Number	Revision Date	Revision Details	Approved By
Rev. 0: Concept A	26 Jan 2012	Initial attempt at Electrical DSTG	
Rev. 0: Concept B	10 Jun 2012	Further attempt with schedule RAH	
Rev. 0: Concept C	9 Sept 2012		
Rev. 0: Concept D	29 Oct 2012	Standard sections 1–3; Formatting	
Rev. 0: Concept D(3)	11 Jan 2013	Software added and other corrections	
Rev .1	12 Mar 2013		Registration Committee for Professional Engineers
Rev. 2	22 Sept 2017	Review in accordance with approved DSTG Framework	RA Harker
Rev. 2	9 Oct 2017	For approval via round robin	PDSGC
Rev. 2	23 Oct 2017	Reviewed and checked	B Collier-Reed; TP Maphumulo, J Cato
Rev. 2	16 Nov 2017	For approval	PDSGC

The Discipline-Specific Training Guide (DSTG) for:
Registration as a Professional Engineer in Electrical Engineering

Revision 2 dated 16 November 2017 and consisting of 30 pages has been reviewed for adequacy by the Business Unit Manager and is approved by the Executive: Policy Development and Standards Generation (PDSG).

.... 30/05/2018 ....

Business Unit Manager — Date

.... 30/5/2018 ....

Executive: **PDSG** — Date

APPENDIX: TRAINING ELEMENTS

1	Introduction
1.1	***Induction programme (Typically 1–5 days)***
1.1.1	Company structure
1.1.2	Company policies
1.1.3	Company Code of Conduct
1.1.4	Company safety regulations
1.1.5	Company staff code
1.1.6	Company regulations
	Exposure to Practical Aspects of Engineering (Typically 6–12 months) and covers how things are: (Responsibility level A & B)
1.2.1	(Experience in one or more of these sectors but not all) Manufacturing
1.2.2	Construction
1.2.3	Erection
1.2.4	Field installation
1.2.5	Testing
1.2.6	Commissioning
1.2.7	Operation
1.2.8	Maintenance

1.2.9	Fault location
1.2.10	Problem investigation
2	**Design**
2.1	*Experience in design and application of design knowledge (Typically 12–18 months) Focus is on planning, design and application (Responsibility level C & D)*
2.1.1	(In one or more of the above sectors) Analysis of data and systems
2.1.2	Planning of networks and systems
2.1.3	System modelling and integration
2.1.4	System design
2.1.5	Network/circuit design
2.1.6	Component/product design
2.1.7	Software design
2.1.8	Research and investigation
2.1.9	Preparation of specifications and associated documentation
2.1.10	Preparation of contract documents and associated documentation
2.1.11	Development of standards
2.1.12	Application of quality systems
2.1.13	Configuration Management
3	**Engineering tasks**
3.1	***Experience in the execution of engineering tasks (Rest of training period) Focus should be on projects and project management*** (Responsibility Level E)
3.1.1	(Working in one or more of these sectors but not all) Design

3.1.2	Manufacture
3.1.3	Construction
3.1.4	Erection
3.1.5	Installation
3.1.6	Commissioning
3.1.7	Maintenance
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3.2.2	Optimisation of resources and processes
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3.3.1	Monitor progress and delivery
3.3.2	Monitor quality
3.4	***Completion of 3.1*** (Responsibility Level E)
3.4.1	Commissioning completion
3.4.2	Documentation completion
3.4.3	Documentation handover
3.5	***Maintenance and repair of 3.1***

3.5.1	(Responsibility Level E) Planning and scheduling maintenance
3.5.2	Monitor quality
3.5.3	Oversee maintenance and repair
4	**Risk and impact mitigation**
4.1	***Impact and risk assessments***
4.1.1	(Responsibility Level E)
4.1.2	Risk assessments
4.2	***Regulatory compliance***
4.2.1	(Responsibility Level E) Health and safety
4.2.2	Codes and standards
4.2.3	Legal and regulatory
5	**Managing engineering activities**
5.1	***Self-management***
5.1.1	Manages own activities
5.1.2	Communicates effectively
5.2	***Team environment***
5.2.1	Participates in and contributes to team planning activities
5.2.2	Manages people

5.3	***Professional communication and relationships (Networking)***
5.3.1	Establishes and maintains professional and business relationships
5.3.2	Communicates effectively
5.4	***Exercising judgement and taking responsibility***
5.4.1	(Responsibility Level E) Ethical practices
5.4.2	Code of Conduct
5.4.3	Exercises sound judgement in the course of complex engineering activities
5.4.4	Is responsible for decision-making in some or all engineering activities
5.5	***Competency development***
5.5.1	Plans own development programme
5.5.2	Constructs initial professional development record