



ENSURING THE EXPERTISE TO GROW SOUTH AFRICA

Code of Practice for the Performance of Computer Engineering Work

R-02-COP-COMP

REVISION No. 0:

ENGINEERING COUNCIL OF SOUTH AFRICA
Tel: 011 6079500 | Fax: 011 6229295
Email: engineer@ecsa.co.za | Website: www.ecsa.co.za





Document No.: R-02-COP-COMP	Revision No.: 0	Effective Date:	
Subject: Code of Practice for the Performance of Computer Engineering Work			
Compiled by: Manager RPS	Approved by: Executive RPS	Next Review Date:	Page 2 of 27
Date: XXXX	Date: XXX		

TABLE OF CONTENTS

DEFINITIONS	4
ABBREVIATIONS	6
1. INTRODUCTION	7
1.1 Scope.....	7
1.2 Purpose	8
1.3 Applicable Legislative Framework.....	8
2. IDENTIFICATION AND CLASSIFICATION	9
2.1 Types.....	9
2.2 Technologies.....	9
2.3 Aspects	11
2.4 Functions	12
2.5 Industries	13
3. IMPLEMENTATION	14
3.1 Consult.....	14
3.2 Research	14
3.3 Specifications.....	14
3.4 Design and development.....	14
3.5 Installation.....	15
3.6 Commissioning services.....	15
3.6.1 Co-ordination	15
3.6.2 Management.....	15
3.7 Testing.....	15
3.8 Maintenance	16
4. EDUCATION	Error! Bookmark not defined.
5. COMPETENCY REQUIREMENTS	16
5.1 Competence required.....	16
5.2 Competence evaluation	17

CONTROLLED DISCLOSURE


When downloaded for the ECSA Document Management System, this document is uncontrolled and the responsibility rest with the user to ensure that it is in line with the authorized version on the ECSA Document Management System.

Document No.: R-02-COP-COMP	Revision No.: 0	Effective Date:	
Subject: Code of Practice for the Performance of Computer Engineering Work			
Compiled by: Manager RPS	Approved by: Executive RPS	Next Review Date:	Page 3 of 27
Date: XXXX	Date: XXX		

5.3	Risk categories (risk of occurrence versus severity of occurrence)	17
5.3.1	Low risk	17
5.3.2	Moderate risk	18
5.3.3	High risk	18
6.	GOOD PRACTICE REQUIREMENTS	19
6.1	General good practice	19
6.2	Health, safety and environment	20
6.3	Ethical considerations	20
6.4	Codes and standards	21
6.5	Computer Engineering data	22
6.6	Reporting	22
6.7	Quality and risk management	22
6.8	The design process	23
6.9	Design requirements	23
6.9.1	Calculations and simulations	23
6.9.2	Drawings	Error! Bookmark not defined.
6.9.3	Testing	25
6.9.4	Documentation	25
6.9.5	Quality	25
6.9.6	Records	25
6.10	Due diligence	26
6.11	Acts and regulations	26
	REVISION HISTORY	27

CONTROLLED DISCLOSURE

When downloaded for the ECSA Document Management System, this document is uncontrolled and the responsibility rest with the user to ensure that it is in line with the authorized version on the ECSA Document Management System.

Document No.: R-02-COP-COMP	Revision No.: 0	Effective Date:	
Subject: Code of Practice for the Performance of Computer Engineering Work			
Compiled by: Manager RPS	Approved by: Executive RPS	Next Review Date:	Page 4 of 27
Date: XXXX	Date: XXX		

DEFINITIONS

In this Code of Practice, any word or expression defined in the Act has that meaning unless the context otherwise dictates.

Act means the Engineering Profession Act.

Candidate means a person who is registered in terms of Section 19(2)(b) of the Act.

Category of Registration means the categories of registration provided for in Section 18(1)(a) of the Act, i.e., Professional Engineers, Professional Engineering Technologists, Professional Certificated Engineers and Professional Engineering Technicians.

Code of Conduct means the Code of Conduct for Registered Persons in terms of the Act.

Council means the Engineering Council of South Africa established in terms of Section 2 of the Act.

Designer means the person undertaking work in relation to any structure, including drawings, calculations, design details and specifications.

Computer Engineer means a Professional Engineer registered in terms of 18(1)(a)(i) of the Act who has experience specifically in the of sub-discipline of Computer Engineering.

Computer Engineering Technician means a Professional Engineering Technician registered in terms of section 18(1)(a)(i) of the Act who has experience specifically in the sub-discipline of Computer Engineering.


Computer Engineering Technologist means a Professional Engineering Technologist registered in terms of section 18(1)(a)(i) of the Act who has experience specifically in the sub-discipline of Computer Engineering.

Computer Engineering Work means Engineering Work identified specifically in the discipline of Computer Engineering.

Engineering Work means the work identified in terms of Section 26 of the Act.

CONTROLLED DISCLOSURE

When downloaded for the ECSA Document Management System, this document is uncontrolled and the responsibility rest with the user to ensure that it is in line with the authorized version on the ECSA Document Management System.

Document No.: R-02-COP-COMP	Revision No.: 0	Effective Date:	
Subject: Code of Practice for the Performance of Computer Engineering Work			
Compiled by: Manager RPS	Approved by: Executive RPS	Next Review Date:	Page 5 of 27
Date: XXXX	Date: XXX		

Project Engineers means Registered Persons responsible for the management of the Engineering Work within a project and its technical aspects.

Registered Person means a person registered with the Engineering Council of South Africa in terms of the Act under one of the categories referred to in sections 18 and 19.


Risk means the effect of uncertainty on the objectives of a design, expressed in terms of a combination of the consequences of an event and the likelihood of occurrence.

Specialist Work means Computer Engineering Work that requires training, knowledge and experience outside the normal education curriculum and beyond that which is obtained in the general practice of the profession.

The Code means this code of practice document.

CONTROLLED DISCLOSURE

When downloaded for the ECSA Document Management System, this document is uncontrolled and the responsibility rest with the user to ensure that it is in line with the authorized version on the ECSA Document Management System.


Document No.: R-02-COP-COMP	Revision No.: 0	Effective Date:	
Subject: Code of Practice for the Performance of Computer Engineering Work			
Compiled by: Manager RPS	Approved by: Executive RPS	Next Review Date:	Page 6 of 27
Date: XXXX	Date: XXX		

ABBREVIATIONS

API	American Petroleum Institute
ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers
ASME	American Society of Mechanical Engineers
CAD	Computer Aided Design
CoP	Code of Practice
CPD	Continuing Professional Development
DCS	Digital Control System
ECSA	Engineering Council of South Africa
FAT	Factory Acceptance Test
HMI	Human Machine Interface
IFE	The Institution of Fire Engineers
ISA	International Society for Automation
ISO	International Organization for Standardization
PC	Personal Computer
PLC	Programmable Logic Controller
POPIA	Protection of Personal Information Act, 4 of 2013
Pr Cert Eng	Professional Certificated Engineer
Pr Eng	Professional Engineer
Pr Tech Eng	Professional Engineering Technologist
Pr Techni Eng	Professional Engineering Technician
QCP	Quality Control Plan
Reg Eng Tech	Registered Engineering Technician
SAE	Society of Automotive Engineers
SANS	South African National Standards
SAT	Site Acceptance Test
SCADA	Supervisory control and data acquisition

CONTROLLED DISCLOSURE

When downloaded for the ECSA Document Management System, this document is uncontrolled and the responsibility rest with the user to ensure that it is in line with the authorized version on the ECSA Document Management System.

Document No.: R-02-COP-COMP	Revision No.: 0	Effective Date:	
Subject: Code of Practice for the Performance of Computer Engineering Work			
Compiled by: Manager RPS	Approved by: Executive RPS	Next Review Date:	Page 7 of 27
Date: XXXX	Date: XXX		

1. INTRODUCTION

This Code of Practice has been developed by the Engineering Council of South Africa (ECSA) to supplement the Code of Conduct for Registered Persons: Engineering Profession Act 2000(Act No.46 of 2000).

Section 27 of the Engineering Profession Act 2000 (Act No.46 of 2000) empowers the Council to draw up codes of practice in addition to codes of conduct and it requires all registered persons to comply with such codes. While codes of conduct regulate behaviour, codes of practice regulate engineering practice.

Section 18(1) of the Act provides for registration of professionals and candidates in four categories of registration, namely Professional Engineers, Professional Engineering Technologists, Professional Certificated Engineers and Professional Engineering Technicians. Section 18(2) prohibits persons so registered from practising in a category other than that in which they are registered.

In line with these requirements, this code of practice classifies “engineering work” in the discipline of computer engineering in terms of its complexity and stipulates the category of registration as well as the level of competence required for the execution of such work.

The code does not repeat the expected ethical values and professional standards that are found in the Code of Conduct and Overarching Code of Practice.


1.1 Scope

The Code identifies specific engineering work within the computer engineering field and applies to computer engineering and its sub-disciplines: computer equipment, networks, solution design and development, process optimisation, data collection and consolidation, secure internet and network design, process automation, factory and general automation.

The Code classifies computer engineering work according to the complexity of the work and its sensitivity concerning public safety, asset and equipment safety as well as environmental

CONTROLLED DISCLOSURE

When downloaded for the ECSA Document Management System, this document is uncontrolled and the responsibility rest with the user to ensure that it is in line with the authorized version on the ECSA Document Management System.

Document No.: R-02-COP-COMP	Revision No.: 0	Effective Date:	
Subject: Code of Practice for the Performance of Computer Engineering Work			
Compiled by: Manager RPS	Approved by: Executive RPS	Next Review Date:	Page 8 of 27
Date: XXXX	Date: XXX		

stewardship. Most computer engineering work involves risk due to the nature of the product and the impact of its incorrect application.

1.2 Purpose

In terms of the Standards Act, 29 of 1993, “a code of practice is a description of –

- (a) the terminology to be used;
- (b) the method to be applied or the procedure to be followed;
- (c) the material to be used;
- (d) any other requirements to be met (e.g., competency) in connection with the execution in an orderly, systematic, practical, efficient, safe and effective manner of an act performed, with a view to achieving a stated purpose or obtaining a stated result.”

The purpose of the Code is to:

- identify engineering work in the discipline of computer engineering and to classify such work in terms of its complexity
- establish the appropriate level of competence required for the execution of various classes of computer engineering work
- make provision for and regulate the execution of computer engineering work by registered professionals in other fields
- set and reinforce technical and ethical standards for the execution of computer engineering work.


1.3 Applicable Legislative Framework

This Code should be read in conjunction with the following:

- Engineering Profession Act 2000 (Act No.46 of 2000)
- Code of Conduct
- Occupational Health and Safety Act, 85 of 1993

CONTROLLED DISCLOSURE

When downloaded for the ECSA Document Management System, this document is uncontrolled and the responsibility rest with the user to ensure that it is in line with the authorized version on the ECSA Document Management System.

Document No.: R-02-COP-COMP	Revision No.: 0	Effective Date:	
Subject: Code of Practice for the Performance of Computer Engineering Work			
Compiled by: Manager RPS	Approved by: Executive RPS	Next Review Date:	Page 9 of 27
Date: XXXX	Date: XXX		

- Overarching Code of Practice for the Performance of Engineering Work
- Identification of Engineering Work Rules
- All other relevant legislation

2. IDENTIFICATION AND CLASSIFICATION

2.1 Computer and software engineering work includes the following practice areas:


- Conducting research and developing new or improving theories and methods related 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, materials, quality and safety standards and directing production or installation work 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 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 communications networks based on wired, fibre optical and wireless communication media and ultra-high speed data networks;
- System analysis, designing and developing complex computer-based systems and implementing these through appropriate choice of hardware and managing the development the necessary software;
- Determining manufacturing methods for computer-based systems as well as the maintenance and repair of existing computer-based systems, networks and equipment.

2.2 Technologies

- Enterprise resource planning
- Materials requirements planning

CONTROLLED DISCLOSURE


When downloaded for the ECSA Document Management System, this document is uncontrolled and the responsibility rest with the user to ensure that it is in line with the authorized version on the ECSA Document Management System.

Document No.: R-02-COP-COMP	Revision No.: 0	Effective Date:	
Subject: Code of Practice for the Performance of Computer Engineering Work			
Compiled by: Manager RPS	Approved by: Executive RPS	Next Review Date:	Page 10 of 27
Date: XXXX	Date: XXX		

- Product lifecycle management
- Telemetry and IIOT devices
- Supply chain management
- Advanced planning and scheduling
- Advanced visioning & diagnostic systems
- Industrial software engineering
- Digital twins
- Augmented reality
- Artificial intelligence
- Machine learning
- Data management
- Data analytics
- Robotics – kinematics, electronic sensors, software integration
- Biometrics
- Solutions architect – full design approach
- Industrial internet of things and cloud systems
- Smart factory
- Autonomous processes, systems and operations
- Cyber security
- Wide area and local area network topologies
- Industrial network topologies
- Telecommunication devices and installations
- Process optimisation
- Process modelling tools
- Control philosophies
- Embedded controllers (including microcontrollers)
- Data acquisition, logging and recording
- Sensors, transducers and measurement systems
- Safety systems and design

CONTROLLED DISCLOSURE

When downloaded for the ECSA Document Management System, this document is uncontrolled and the responsibility rest with the user to ensure that it is in line with the authorized version on the ECSA Document Management System.

Document No.: R-02-COP-COMP	Revision No.: 0	Effective Date:	
Subject: Code of Practice for the Performance of Computer Engineering Work			
Compiled by: Manager RPS	Approved by: Executive RPS	Next Review Date:	Page 11 of 27
Date: XXXX	Date: XXX		

- Additive and subtractive manufacturing
- Energy efficiency and renewable systems
- Vision systems
- Automation safety and best practices from an automation perspective
- Software programming languages – C#, Python, C, Web Technologies, Database programming, MATLAB, C++, R, etc.
- Numerical analysis methods
- Single board computers
- Windows and Linux-based operating systems
- Circuit analysis and design
- Power electronics and drives – motors, drives, power supplies
- Workflow systems

2.3 Aspects

Below is an outline of the different aspects of computer engineering work:

Group A: Engineering problem solving

- Define, investigate and analyse engineering problems. These engineering problems are not limited to the computer engineering field.
- Design or develop solutions to engineering problems.
- Comprehend and apply advanced knowledge: principles, specialist knowledge, jurisdictional and local knowledge.

Group B: Managing engineering activities


- Manage part or all of one or more engineering activities, including time management.
- Communicate clearly with others during engineering activities.

Group C: Impacts of engineering activities

- Recognise and address the reasonably foreseeable social, cultural and environmental effects of engineering activities.

CONTROLLED DISCLOSURE

When downloaded for the ECSA Document Management System, this document is uncontrolled and the responsibility rest with the user to ensure that it is in line with the authorized version on the ECSA Document Management System.

Document No.: R-02-COP-COMP	Revision No.: 0	Effective Date:	
Subject: Code of Practice for the Performance of Computer Engineering Work			
Compiled by: Manager RPS	Approved by: Executive RPS	Next Review Date:	Page 12 of 27
Date: XXXX	Date: XXX		

- Meet all legal and regulatory requirements and protect the health and safety of persons during engineering activities.

Group D: Act ethically, exercise sound judgement and take responsibility

- Conduct engineering activities ethically.
- Exercise sound judgment in the course of engineering activities.
- Be responsible and accountable for making decisions on part of or all engineering activities.

Group E: Initial professional development

- Undertake professional development activities sufficient to maintain and extend competence.


2.4 Functions

The computer engineering field consists of any or a combination of the following types of work within computer devices, factory automation, process automation and general automation:

- Audits
- Build
- Business analysis
- Calibration
- Change management
- Consulting
- Functional and technical solution design documents
- Hardware and software architecture design
- Solution and application development
- Database design development and administration
- Education
- Graphic design
- Software lifecycle management

CONTROLLED DISCLOSURE

When downloaded for the ECSA Document Management System, this document is uncontrolled and the responsibility rest with the user to ensure that it is in line with the authorized version on the ECSA Document Management System.

Document No.: R-02-COP-COMP	Revision No.: 0	Effective Date:	
Subject: Code of Practice for the Performance of Computer Engineering Work			
Compiled by: Manager RPS	Approved by: Executive RPS	Next Review Date:	Page 13 of 27
Date: XXXX	Date: XXX		

- Optimisation
- Production and plant operation
- Project management
- Prototyping
- Research
- Software and hardware upgrade
- Retirement / end-of-life replacement
- Testing and commissioning and fault-finding
- Troubleshooting and debugging.


2.5 Industries

The computer engineering field includes any industry or industry sector where the engineering work, as defined, includes among others, the following:

- The development of any system processing and/or storing confidential or restricted data.
- The development of any system essential for the continuous safe operation of people, processes or devices.
- The development of any system essential for the continuous safe manufacture or processing of physical products, including but not limited to, electricity, oil, gas, minerals, metals, food, beverages, medical equipment and devices, fast-moving consumer goods, clothing, furniture, automobiles amongst others.
- The development of any system providing a critical or campus-wide service.
- The development of any system to monitor, detect and react to adverse events before they escalate.
- The development of any system to guide processes which may alter production or financial outcomes.
- The development of any system to monitor, detect and record incidents that will have consequences to the health and safety of product, people or the environment.

CONTROLLED DISCLOSURE

When downloaded for the ECSA Document Management System, this document is uncontrolled and the responsibility rest with the user to ensure that it is in line with the authorized version on the ECSA Document Management System.

Document No.: R-02-COP-COMP	Revision No.: 0	Effective Date:	
Subject: Code of Practice for the Performance of Computer Engineering Work			
Compiled by: Manager RPS	Approved by: Executive RPS	Next Review Date:	Page 14 of 27
Date: XXXX	Date: XXX		

3. IMPLEMENTATION

The computer engineering field is identified and categorised by the following:

3.1 Consult

Consult on the specification, design, installation, configuration, maintenance, operation, performance assessment and optimisation of the Computer systems classified in section 2.1 above.

3.2 Research

Use technologies, engineering knowledge or systematic approaches to research new or improved techniques and methods to design or optimise the computer systems classified in section 2.1 above.

3.3 Specifications

Issue and interpret specifications on the installation, configuration, optimisation, operation, maintenance, testing, safety and eventual retirement or replacement of the computer systems classified in section 2.1 above.


3.4 Design and development

Use technologies, engineering knowledge or systematic approaches to develop new and improved techniques and methods to design or optimise the computer systems classified in section 2.1 above:

- Develop commissioning scope of work and input into the planning process.
- Develop and improve commissioning procedures.
- Develop and improve quality and maintenance plans, including maintainability.

CONTROLLED DISCLOSURE

When downloaded for the ECSA Document Management System, this document is uncontrolled and the responsibility rest with the user to ensure that it is in line with the authorized version on the ECSA Document Management System.

Document No.: R-02-COP-COMP	Revision No.: 0	Effective Date:	
Subject: Code of Practice for the Performance of Computer Engineering Work			
Compiled by: Manager RPS	Approved by: Executive RPS	Next Review Date:	Page 15 of 27
Date: XXXX	Date: XXX		

3.5 Installation

Use technical knowledge, engineering principles and technologies to install and test computer systems, hardware devices and automation systems followed by testing, monitoring, and evaluation of design, construction and installation.

3.6 Commissioning services

Commissioning services include the following:

- Provide commission engineering services.
- Provide consulting services.
- Optimise devices, control loops, processes and systems and plant.

3.6.1 Co-ordination

Co-ordinate commissioning efforts of the technical teams, considering technical, budgetary, logistical, legislative and safety requirements.

3.6.2 Management

- Ensure that commissioning quality plans and checks/check sheets are in accordance with the Original Equipment Manufacturer (OEM) procedures and specifications.
- Perform a technical investigation and root cause analysis into any issues during commissioning.
- Identify and manage or redesign repeat incidents.
- Implement corrective actions and change management.


3.7 Testing

Testing includes the following:

- Debugging of programmed systems.
- Evaluation of materials, environmental interaction, safety and manufacturing integrity, and quality.

CONTROLLED DISCLOSURE

When downloaded for the ECSA Document Management System, this document is uncontrolled and the responsibility rest with the user to ensure that it is in line with the authorized version on the ECSA Document Management System.

Document No.: R-02-COP-COMP	Revision No.: 0	Effective Date:	
Subject: Code of Practice for the Performance of Computer Engineering Work			
Compiled by: Manager RPS	Approved by: Executive RPS	Next Review Date:	Page 16 of 27
Date: XXXX	Date: XXX		

- Perform user acceptance and factory acceptance tests to ensure safe and effective operations

3.8 Maintenance

Maintenance includes maintaining, operating and optimising:

- systems and devices within hazardous areas
- emergency shutdown systems
- industrial telecommunication systems
- robotic systems.
- Software solutions
- Systems integration
- Operator support

4. COMPETENCY REQUIREMENTS

4.1 Competence required


Any person who performs computer engineering work must comply with the requirements contemplated in the Engineering Profession Act 2000(Act No.46 of 2000) to:

- be registered with ECSA in the appropriate professional registration category applicable to the level of service performed; and
- possess the necessary core competency in the categories as specified under Section 18(1)(a)(c) of the Act, to perform such core service as a Professional Engineer, Professional Engineering Technologist, Professional Certificated Engineer, Professional Engineering Technician, or a Specified Category Practitioner in terms of Section 18(1)(c) of the Act or a Candidate registered in terms of Section 18(1)(b) of the Act.

In case of performing computer engineering work in any other category, the computer engineering registered person must comply with the relevant competency requirements imposed by ECSA.

CONTROLLED DISCLOSURE

When downloaded for the ECSA Document Management System, this document is uncontrolled and the responsibility rest with the user to ensure that it is in line with the authorized version on the ECSA Document Management System.

Document No.: R-02-COP-COMP	Revision No.: 0	Effective Date:	
Subject: Code of Practice for the Performance of Computer Engineering Work			
Compiled by: Manager RPS	Approved by: Executive RPS	Next Review Date:	Page 17 of 27
Date: XXXX	Date: XXX		

4.2 Competence evaluation

Computer engineering registered persons may only undertake work that their education, training and experience have rendered them competent to perform and is within their registration category.

ECSA document **R-02-STA-PE/PT/PN**: Competency Standard for Registration in Professional Categories PE/PT/PN define the criteria for assessing competency.

4.3 Risk categories (risk of occurrence versus severity of occurrence)

The product of consequence, the likelihood values and the ease of detection determine the risk value as illustrated in the two-dimensional matrix shown in Figure 1 below:

Risk Categories (Probability * Impact * Undetectability)		Severity of occurrence				
		Negligible	Minor	Moderate	Significant	Severe
Risk of occurrence	Very likely Frequent	Low	Moderate	High	High	High
	Likely Occasional	Low	Moderate	Moderate	High	High
	Possible Remote	Low	Low	Moderate	Moderate	High
	Unlikely Improbable	Low	Low	Moderate	Moderate	High
	Highly Unlikely Extremely Improbable	Low	Low	Low	Moderate	High

Figure 1: Risk categories (risk of occurrence versus severity of occurrence)


4.3.1 Low risk

These risks are typically addressed by persons with tertiary education qualifications in Computer Engineering and working under the supervision and mentorship of persons who meet the requirements stated in document **R-04-T&M-GUIDE-PC** *Training and Mentoring Guide for Professional Categories and Candidate Categories*.

Examples include:

CONTROLLED DISCLOSURE

When downloaded for the ECSA Document Management System, this document is uncontrolled and the responsibility rest with the user to ensure that it is in line with the authorized version on the ECSA Document Management System.

Document No.: R-02-COP-COMP	Revision No.: 0	Effective Date:	
Subject: Code of Practice for the Performance of Computer Engineering Work			
Compiled by: Manager RPS	Approved by: Executive RPS	Next Review Date:	Page 18 of 27
Date: XXXX	Date: XXX		

- The system is easily recoverable and reproducible.
- The system provides an informational / non-critical service.
- It is easy to detect the event before it happens or escalates.

4.3.2 Moderate risk

Persons registered with the ECSA as a Professional Engineer, Professional Engineering Technologist, Professional Engineering Technician or Candidates in the Computer Engineering discipline are the ones who typically address these risks.

Examples include the following:

- System processes and stores non-public or internal-use data.
- Other interrelated systems that internally trust the system.
- The system provides a regular or essential service.
- It is not easy to detect the event before it happens or escalates.

4.3.3 High risk


These risks are typically addressed by persons registered with the ECSA as a Professional Engineer, Professional Engineering Technologist or Professional Engineering Technician or Candidates in the Computer Engineering discipline.

Examples include the following:

- The system processes and/or stores confidential or restricted data.
- The system is essential for the continuous safe operation of the people, process or device.
- The system provides a critical or campus-wide service.
- It is very difficult to detect the event before it happens or escalates.
- The incident will have serious consequences.
- Risk analysis must take into consideration the sensitivity of data processed and stored by the system, as well as the likelihood and impact of potential threat events.

CONTROLLED DISCLOSURE

When downloaded for the ECSA Document Management System, this document is uncontrolled and the responsibility rest with the user to ensure that it is in line with the authorized version on the ECSA Document Management System.

Document No.: R-02-COP-COMP	Revision No.: 0	Effective Date:	
Subject: Code of Practice for the Performance of Computer Engineering Work			
Compiled by: Manager RPS	Approved by: Executive RPS	Next Review Date:	Page 19 of 27
Date: XXXX	Date: XXX		

5. GOOD PRACTICE REQUIREMENTS

5.1 General good practice

All work carried out or services rendered must be:

- in accordance with accepted norms and standards of the computer engineering field
- in an ethical and responsible manner in accordance with the Code of Conduct
- within the area of competency with honesty, fidelity and integrity
- in accordance with the Labour Relations Act, 66 of 1995, as amended
- in accordance with the Protection of Personal Information Act, 4 of 2013 (POPIA), as amended.
- any other applicable legislation.

Prior to taking a role in the computer engineering field, computer engineering registered persons must ensure that they possess the competencies required to undertake the work. In addition, prior to undertaking any task, computer engineering registered persons must ascertain and document:


- the purpose of the activities
- the approach that will be used to execute the activities
- the performance requirements for the activities
- any statutory, regulatory or other requirements that may pertain to the activities.

Computer engineering registered persons must take account of the likely variation in input parameters and the accuracy of the models or methods used and must consider the following:

- All calculations and/or specifications must be independently checked, either by another suitably qualified computer engineering registered person or by alternative calculation methods.
- Prior to approving any work, or signing any completion certificate, computer engineering registered persons must ensure sufficient detailed checks or inspections to warrant such

CONTROLLED DISCLOSURE

When downloaded for the ECSA Document Management System, this document is uncontrolled and the responsibility rest with the user to ensure that it is in line with the authorized version on the ECSA Document Management System.

Document No.: R-02-COP-COMP	Revision No.: 0	Effective Date:	
Subject: Code of Practice for the Performance of Computer Engineering Work			
Compiled by: Manager RPS	Approved by: Executive RPS	Next Review Date:	Page 20 of 27
Date: XXXX	Date: XXX		

approval. Where the checks or inspections were limited in any way or carried out by a third party, approval must be qualified accordingly.

5.2 Health, safety and environment

All computer engineering work must be done in accordance with the following:

- Occupational Health and Safety Act, 85 of 1993, as amended
- National Environmental Management Act, 107 of 1998, as amended
- Any other applicable legislation.

Cognisance should be taken of health and safety requirements from planning to completion of any computer engineering work.

The environmental impact of all computer engineering work should be assessed and appropriate measures taken to minimise such impacts or to remediate areas so impacted.

Computer engineering registered persons must involve relevant expertise when identified impacts of the computer engineering field are outside their area of expertise.

The client must immediately be notified of any condition that is observed which may compromise the health and safety of persons or the environment.


5.3 Ethical considerations

The following ethical considerations are required:

- Computer engineering registered persons must comply with the ECSA Code of Conduct.
- Cognisance should be taken of any potential social and cultural impacts of the computer engineering field on the communities within which work is conducted.
- The client must immediately be notified of any condition that is observed which may result in social or cultural impacts.

CONTROLLED DISCLOSURE

When downloaded for the ECSA Document Management System, this document is uncontrolled and the responsibility rest with the user to ensure that it is in line with the authorized version on the ECSA Document Management System.

Document No.: R-02-COP-COMP	Revision No.: 0	Effective Date:	
Subject: Code of Practice for the Performance of Computer Engineering Work			
Compiled by: Manager RPS	Approved by: Executive RPS	Next Review Date:	Page 21 of 27
Date: XXXX	Date: XXX		

5.4 Codes and standards

All computer engineering work must be carried out in accordance with the norms of the profession, and these norms are generally represented by the Computer and Automation Engineering relevant national and international standards, industry standards, codes of practice and best practice guidelines.

Standards and codes must be applied as and when required by government regulation, customer or end-user requirements and as an accepted industry norm.

It is the duty of computer engineering registered persons to ensure that all standards and codes used abide by the applicable acts and regulations (considering that more than one country's legal frameworks may be relevant).

Standards and codes may be used in place of regulations where it can be proved that the requirements of the standard or code meet and/or exceed those prescribed by regulations and/or law.


Any deviations from the standards or codes requested by the customer or end-user should be communicated to the appropriate stakeholder, supported by evidence that the deviation will compromise the performance and safety of the system or device.

Various international bodies are recognised and accepted within industry to develop and publish standards related to the computer engineering field, notably:

- SANS – South African National Standards
- ASME – American Society of Mechanical Engineers
- ASHRAE – American Society of Heating, Refrigerating and Air-Conditioning Engineers
- ISO – International Standard Organization
- SAE – Society of Automotive Engineers
- API – American Petroleum Institute
- IFE – The Institution of Fire Engineers
- ASTM International.

CONTROLLED DISCLOSURE

When downloaded for the ECSA Document Management System, this document is uncontrolled and the responsibility rest with the user to ensure that it is in line with the authorized version on the ECSA Document Management System.

Document No.: R-02-COP-COMP	Revision No.: 0	Effective Date:	
Subject: Code of Practice for the Performance of Computer Engineering Work			
Compiled by: Manager RPS	Approved by: Executive RPS	Next Review Date:	Page 22 of 27
Date: XXXX	Date: XXX		

5.5 Computer Engineering Data

Sufficient quantitative or qualitative data is required for all computer engineering tasks.

Computer engineering registered persons should ensure that the data used is adequate for the intended purpose. Where this is not the case, additional data should be obtained, or the work should be based on parameter values selected such that the occurrence of less favourable values is unlikely.

Data analysis should be presented in sufficient detail to allow independent assessment of the data.

5.6 Reporting

During the planning of an activity, computer engineering registered persons should ascertain the purpose for which the activity is required and the nature of the proposed activity. Computer engineering registered persons must ensure that the proposed activity can yield the information required for that purpose.

Computer engineering registered persons should advise the client of the effect of any restrictions placed on the activity that are likely to adversely affect the accuracy or adequacy of the data obtained. This information may be presented as a single report or in two separate reports: a factual report and an interpretive report. All assumptions must be clearly documented as well as the reason for the specific assumption.


5.7 Quality and risk management

Computer engineering registered persons must implement quality and risk management systems covering all aspects of their work, appropriate to the nature and size of the work.

Quality management and risk management systems must be reviewed on a regular basis. Compliance with the quality and risk management systems should be audited at least annually. Organisations undertaking engineering work should consider external certification, such as ISO 9001 and ISO 14001.

CONTROLLED DISCLOSURE

When downloaded for the ECSA Document Management System, this document is uncontrolled and the responsibility rest with the user to ensure that it is in line with the authorized version on the ECSA Document Management System.

Document No.: R-02-COP-COMP	Revision No.: 0	Effective Date:	
Subject: Code of Practice for the Performance of Computer Engineering Work			
Compiled by: Manager RPS	Approved by: Executive RPS	Next Review Date:	Page 23 of 27
Date: XXXX	Date: XXX		

5.8 The design process

Computer engineering registered persons need to follow an acceptable procedure of either a sequential or a concurrent design process that could include design procedures as follows:

Sequential design procedure

- Problem identification: First, a clear statement of the need for and objectives for the design must be written.
- Ideation: Technical documents are often used to convey concepts to multidisciplinary teams.
- Refinement/analysis: Designs may be rethought, based on engineering analysis. Process Flows, Workflows, Information Flows drawings, process or equipment state models and business process modelling notation (BPMN) tools are useful during the analysis and refinement stage. Accurate use-case models, process/workflows and information flow diagrams are created to refine the design.
- Implementation/documentation: Operating and/or user manuals providing the details of system operation are finalised and approved.

Concurrent design procedure

A systematic approach that integrates the design and development of products with the goal of optimising all elements involved in the life cycle of the product.

5.9 Design requirements


Computer engineering registered persons should incorporate engineering design processes and procedures that address society's needs, desires and problems by applying scientific principles, experience and creativity. The following subsections highlight standard procedure and practice required within project documentation.

5.9.1 Calculations and simulations

Computer designs may include calculations and simulations to demonstrate and test process operation and anomaly handling. Computer engineering registered persons are expected to

CONTROLLED DISCLOSURE

When downloaded for the ECSA Document Management System, this document is uncontrolled and the responsibility rest with the user to ensure that it is in line with the authorized version on the ECSA Document Management System.

Document No.: R-02-COP-COMP	Revision No.: 0	Effective Date:	
Subject: Code of Practice for the Performance of Computer Engineering Work			
Compiled by: Manager RPS	Approved by: Executive RPS	Next Review Date:	Page 24 of 27
Date: XXXX	Date: XXX		

use design tools to simulate, analyse and test designs efficiently, accurately and quickly.

Typical design tools include the following:

- Common CAE packages used include Finite Element Analysis (FEA)
- Business Process Modelling Notation (BPMN) tools
- Unified Modelling Language (UML)
- Hazard and Operations (HAZOP) Studies
- Value Reference Model
- Software Simulation tools
- SIPOC modelling: Suppliers-Input (Requirements) - Process-Output (Requirements) - Customers
- Capability and Maturity Model Integration (CMMI)
- SOA Maturity Model
- Levels of Information Systems Interoperability (LISI) Reference Model
- Zachman Framework for Enterprise Architecture
- Supply Chain Operations Reference (SCOR)
- Value Stream Mapping (VSM)
- Manufacturing optimisation software etc.


5.9.2 Documents

Technical documents can take many forms: idea or concept drawings such as the drawings on the previous page User Requirement Specifications, Functional Design Specifications, Detail Design Specifications, Entity Relationship Diagrams, Database Design documents, Factory Acceptance Test documents, Site Integration Acceptance Test documents, Site Acceptance Test documents and Final Handover Certificates are all examples of technical documents. Technical documents serve one of three purposes:

- Visualisation
- Communication
- Validation.

CONTROLLED DISCLOSURE

When downloaded for the ECSA Document Management System, this document is uncontrolled and the responsibility rest with the user to ensure that it is in line with the authorized version on the ECSA Document Management System.

Document No.: R-02-COP-COMP	Revision No.: 0	Effective Date:	
Subject: Code of Practice for the Performance of Computer Engineering Work			
Compiled by: Manager RPS	Approved by: Executive RPS	Next Review Date:	Page 25 of 27
Date: XXXX	Date: XXX		

5.9.3 Testing

Testing should be conducted in accordance with an established doctrine, if possible, that adheres to the project field's governing, regulatory body. If no such body exists, then testing should be done in accordance with the scientific method, with the methodology fully documented to ensure replication and validation by third parties.

5.9.4 Document Storage

All the information to manage, design, analyse, simulate, package, market and develop a product should be stored in a single complex digital database. This database should be able to be shared with a diverse (and perhaps geographically distant) group of users.

5.9.5 Quality

Computer Engineering Registered Persons should apply a systematic methodology to design "quality" into their products as well as to measure performance and make decisions based on data. Methodologies could include the following:


- Design for Six Sigma (DFSS) is an approach that uses engineering and statistical tools to design products in a way that predicts and minimises customer and manufacturing problems.
- Six Sigma is a process that originated at Motorola to improve quality by reducing or eliminating defects.
- DMAIC – Define, Measure, Analyse, Improve and Control are steps in a continuous improvement process that attempts to define and ensure critical to function (CTF) characteristics.
- QFD – Quality Function Deployment is a tool for decision-making that helps companies focus on a customer-driven approach and set of product characteristics.

5.9.6 Records

Product data management (PDM) systems or enterprise data management (EDM) systems electronically store the various types of data associated with designing and manufacturing a

CONTROLLED DISCLOSURE

When downloaded for the ECSA Document Management System, this document is uncontrolled and the responsibility rest with the user to ensure that it is in line with the authorized version on the ECSA Document Management System.

Document No.: R-02-COP-COMP	Revision No.: 0	Effective Date:	
Subject: Code of Practice for the Performance of Computer Engineering Work			
Compiled by: Manager RPS	Approved by: Executive RPS	Next Review Date:	Page 26 of 27
Date: XXXX	Date: XXX		

product. A Computer Engineering Project should include an effective PDM system that allows all the product data to be quickly stored, retrieved, displayed, printed, managed and transferred anywhere in the organisation. This allows for designs to be optimised or directly modified at any time.

5.10 Due diligence

Computer Engineering Registered Persons should endeavour to optimise an engineering solution that minimises harmful impacts on both the environment and society as far as reasonably possible. All projects, products, operations and systems created by Computer Engineering Registered Persons must adhere to “industry best practices” and legal restrictions and requirements. It is the responsibility of Computer Engineering Registered Persons to seek out and familiarise themselves with the requirements relevant to their project.


5.11 Acts and regulations

Computer Engineering Registered Persons must always ensure compliance with the appropriate acts and associated regulations. Notable national acts that may apply to Computer Engineering Work include the following:

- Engineering Profession Act 2000 (Act No.46 of 2000), as amended
- Occupational Health and Safety Act, 85 of 1993, as amended
- Mine Health and Safety Act, 29 of 1996, as amended
- National Building Regulations and Building Standards Act, 103 of 1977, as amended
- National Environment Management Act, 107 of 1998, as amended.

CONTROLLED DISCLOSURE

When downloaded for the ECSA Document Management System, this document is uncontrolled and the responsibility rest with the user to ensure that it is in line with the authorized version on the ECSA Document Management System.

Document No.: R-02-COP-COMP	Revision No.: 0	Effective Date:	
Subject: Code of Practice for the Performance of Computer Engineering Work			
Compiled by: Manager RPS	Approved by: Executive RPS	Next Review Date:	Page 27 of 27
Date: XXXX	Date: XXX		

REVISION HISTORY

Revision number	Revision date	Revision details	Approved by
Rev. 0 Draft A	16 January 2023	New document	RPS & Working Group
Rev. 0 Draft B	02 March 2023	Steering Committee Draft	Steering Committee
		Broader Consultation Draft	Working Group
		Incorporation of comments received from Broader Consultation	Working Group
		Steering Committee recommendation to submit to RPSC for approval	Steering Committee
		Approval by RPSC	RPSC

CONTROLLED DISCLOSURE

When downloaded for the ECSA Document Management System, this document is uncontrolled and the responsibility rest with the user to ensure that it is in line with the authorized version on the ECSA Document Management System.