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SOUTH AFRICA

# Sub Discipline-Specific Training Guide for Registration as a Rational Designer (Glazing Specialist) in Specified Category

## R-05-RD-SC

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ECSA

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## DEFINITIONS

**Accredited qualification**: A qualification awarded on successful completion of an accredited programme.

**Alternative Route:** Refers to an applicant who aspires to become registered in a Specified Category and who have acquired experience as stipulated in document **R-01-POL-SC**.

**Assessor:** A professionally registered person who carries out the Experience Appraisal assessment.

**Benchmark Route:** The normal process required to attain registration that consists of the completion of an accredited, recognised qualification for the category of registration.

**Building**: In the context of this document, it will include:

(a) any other structure, whether of a temporary or permanent nature and irrespective of the materials used in the erection thereof, erected or used for or in connection with –

  (i) the accommodation or convenience of human beings or animals
  (ii) the manufacture, processing, storage, display or sale of any goods
  (iii) the rendering of any service
  (iv) the destruction or treatment of refuse or other waste materials
  (v) the cultivation or growing of any plant or crop

(b) any wall, swimming bath, swimming pool, reservoir or bridge or any other structure connected therewith

(c) any fuel pump or any tank used in connection therewith

(d) any part of a building, including a building as defined in paragraph (a), (b) or (c)

(e) any facilities or system, or part or portion thereof, within or outside but incidental to a building, for the provision of a water supply, drainage, sewerage, stormwater disposal, electricity supply or other similar service in respect of the building.

**Candidate:** A person holding a qualification or combination of qualifications evaluated by ECSA as meeting its standard as a Glazing Specialist or a person undergoing individual assessment approved by ECSA toward achievement of professional registration.

**Competency area:** The performance area where all the outcomes can be demonstrated at the level prescribed in a specific technology in an integrated manner.

**Competency Assessment:** A summative assessment of an individual's competency against the prescribed standard based on evidence from the individual's work, reports by qualified observers and other tests that may include a Professional Review.

**Competency indicators:** The typifying guide to evidence indicating competence and is not normative.

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

**Competent Person (Glazing):** A person who is recognised by an institute, who has specialist expertise in the field of glazing, as generally having the necessary experience and training to determine glazing requirements in accordance with the provisions of this standard (SANS 10137).

**Competent Person (Structures):** A person who is:

(a) registered in terms of the Engineering Profession Act, 46 of 2000, as either a Professional Engineer or a Professional Engineering Technologist

(b) generally recognised as having the necessary experience and training to undertake rational assessments or rational designs in the field of structural systems (SANS 10400-Part B).

**Continuing Professional Development:** The systematic, accountable maintenance, improvement and broadening of knowledge and skills and the development of the personal qualities necessary for the execution of professional and technical duties throughout an engineering Specialist's career after professional registration.

**Experience Appraisal:** A documentary assessment of the applicant's evidence of competence.

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

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

**Glass:** inorganic glazing material used in buildings typically as defined by SANS 50572 series of soda lime silica glass including the variants annealed, patterned, laminated, toughened, laminated toughened, organic coated glass (painted, coated, mirrored, filmed etc) and surface modified glasses such as etched and sandblasted and polished.

**Glazing** (*noun*)**:** Glass, plastics and organic coated glass fixed in frames in windows, doors, and roof lights, or that form doors (SANS 10400-N).

**Glazing** (*verb*)**:** The act of installing glazing into or onto a building or other structure.

**Generic baseline competency:** The competency for a Professional Category defined in terms of outcomes and including the expected level of performance that can be demonstrated in a range of occupational contexts.

**Initial professional development:** Systematic participation in the activities typical of Continuing Professional Development but carried out prior to professional registration.

**Integrated Performance:** An overall satisfactory outcome of an activity requires several outcomes to be satisfactorily attained; for example, a design will require analysis, synthesis, analysis of impacts, checking of regulatory conformance and judgement in decisions.

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

**Knowledge area*:*** An important subject area that forms part of the overall knowledge base needed for a certain competency.

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

- direct and control all that is constructed or results from construction or manufacturing operations
- operate engineering works safely and in the manner intended
- return engineering works, plant and equipment to an acceptable condition by the renewal, replacement or mending of worn, damaged or decayed parts
- direct and control engineering processes and systems in addition to the commissioning, operation and decommissioning of equipment
- maintain equipment or engineering works in a state in which it can perform its required function.

**Mentor:** An ECSA Registered Person (Professional Engineer or Professional Engineering Technologist or Professional Technician) who guides the competency development of an applicant in an appropriate category and/or is registered with South African Glass Institute (SAGI).

**Moderator:** A Professionally Registered Person who carries out the moderation of the Experience Appraisal and Professional Review assessments.

**Outcome:** A statement of the performance that a person must demonstrate to be judged competent at the specified category level.

**Practice area:** A distinctive area of knowledge and expertise developed by an Engineering Specialist through the path of education, training and experience followed by competence and responsible application in practice.

**Prescribed standards:** The Competency Standards (outcomes) for the category and the sub discipline-specific requirements (if any) that must be satisfied by an applicant for registration.

**Professional Review:** An integrative assessment of the applicant's competence, including professional attributes specified in the standard and sub discipline-specific requirements for the category and the sub discipline via a comprehensive review of the applicant's evidence and an interview.

**Range statement:** The required extent of or limitations on expected performance stated in terms of situations and circumstances in which outcomes are to be demonstrated in a particular competency area.

**Rational Designer (Glazing Specialist):** Rational Designer (Glazing Specialist): Is registered in terms of the Engineering Profession Act, 46 of 2000, as either a Professional Engineer or a Professional Engineering Technologist in Civil Engineering and overlaps with other disciplines and is professionally recognised as having the necessary experience and training to undertake rational assessments or rational designs in the field of structural systems incorporating glazing as defined in SANS 10400.

**Reviewer:** A Professionally Registered Person who carries out the Professional Review assessment.

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

**Specified Category Practitioner Glazing**: means a person registered in terms of Section 18 (1) (c) of the Engineering Professional Act carrying out specifically defined engineering activities in the field of glazing.

**Standards:** Statements of outcomes to be demonstrated and the levels of performance and content baseline requirements in the context of engineering educational programmes.

**Substantial equivalence** (applied to educational programmes)**:** Two programmes while not meeting a single set of criteria are both acceptable for preparing their respective graduates to gain training and experience towards professional registration.

**Supervisor:** A person who oversees and controls engineering work performed by an applicant.

## ABBREVIATIONS

| | |
|---|---|
| **BDEA** | Broadly defined engineering problem |
| **BIFSA** | Building Industries Federation South Africa |
| **C&U** | Commitment and Undertaking |
| **CESA** | Consulting Engineers South Africa |
| **CPD** | Continuing Professional Development |
| **DSTG** | Discipline-specific Training Guide |
| **EA** | Experience Appraisal |
| **ECSA** | Engineering Council of South Africa |
| **EPA** | Engineering Profession Act, 46 of 2000 |
| **LPC** | Loss Prevention Council |
| **NBR** | National Building Regulations |
| **PE** | Professional Engineer |
| **PN** | Professional Engineering Technician |
| **PR** | Professional Review |
| **Pr Cert Eng** | Professional Certificated Engineer |
| **Pr Eng** | Professional Engineer |
| **Pr Tech Eng** | Professional Engineering Technologist |
| **Pr Techni Eng** | Professional Engineering Technician |
| **PT** | Professional Engineering Technologist |
| **QE** | Qualification Evaluation |
| **RD** | Rational Design |
| **SANS** | South African National Standards |
| **SAGI** | South African Glass Institute |
| **SC** | Specified Category |
| **TER** | Training and Experience Report |
| **TES** | Training and Experience Summary |
| **VA** | Voluntary Association |

## BACKGROUND

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

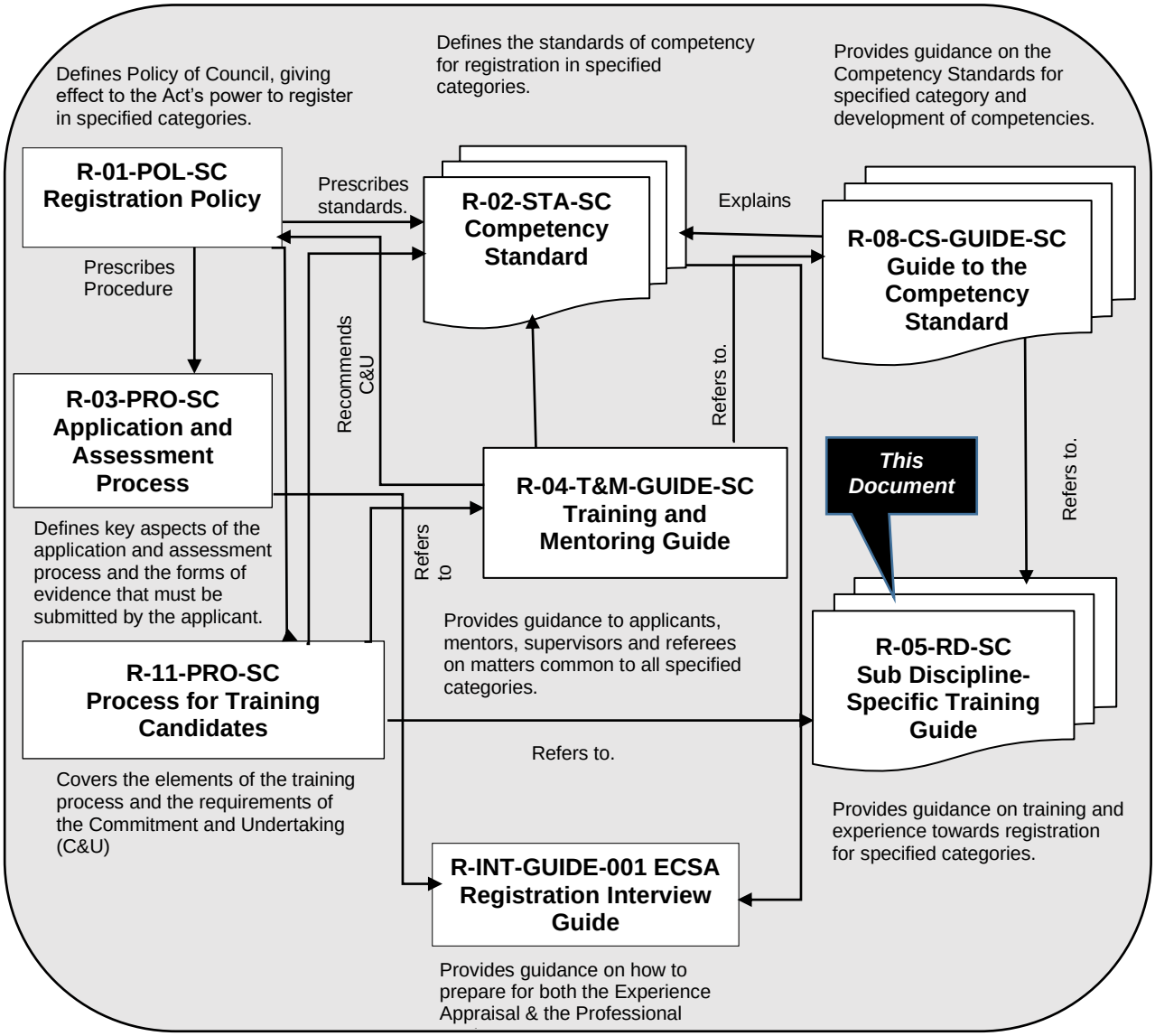


**Figure 1: Documents defining the ECSA registration system**

## 1. PURPOSE OF THIS DOCUMENT

All persons applying for registration in the Specified Category of Rational Designer Glazing Specialist (Applicant Glazing Specialist) are expected to demonstrate the competencies specified in document **R-02-STA-SC** through work performed at the prescribed level of responsibility. In addition, the sub discipline-specific requirements set out in **Section 8.8.2** below must be met.

This training requirements document supplements the generic *Training and Mentoring Guide* (document **R-04-T&M-GUIDE-SC**), the *Guide to the Competency Standards for Registered Specialists* (document **R-08-CS-GUIDE-SC)** and the *Process for Training Engineering Applicants towards Specified Category Registration* (document **R-11-PRO-SC**).

In document **R-04-T&M-GUIDE-SC**, attention is drawn to the following sections:

- Duration of training and period working at level required for registration
- Principles of planning Training and Experience
- Progression of Training Programme
- Documenting Training and Experience
- Demonstrating responsibility.

The second set of documents (documents **R-08-CS-GUIDE-SC**) is applicable to Alternative Route applicants. It provides both a high-level and an outcome-by-outcome understanding of the Competency Standards as an essential basis for this sub discipline-specific training requirements document.

The third document (document **R-11-PRO-SC**) elaborates on the elements of the training process and the requirements of the Commitment and Undertaking (C&U).

This training requirements document and the documents **R-04-T&M-GUIDE-SC**, **R-08-CS-GUIDE-SC** and **R-11-PRO-SC** are subordinate to the *Policy on Registration* (document **R-01-POL-SC**), the *Competency Standards* (document **R-02-STA-SC**) and the application process definition (document **R-03-PRO-SC**).

## 2. AUDIENCE

This guide is directed towards Applicants and their supervisors and mentors in the sub discipline of Glazing Specialist. The requirements are intended to support a programme of training for Rational Designers (Glazing Specialist) to gain experience incorporating good practice elements.

The requirements are directed towards the members of the engineering team as listed in Table 1. The table present the different categories for the engineering team of registered practitioners who accept full responsibility for their area of work and adhere to the ECSA Code of Conduct and the Engineering Professions Act, 46 of 2000 (EPA).

**Table 1: Different categories of registered Specialists in engineering team**

| Category | Authority | Underpinning knowledge | Area of responsibility |
|---|---|---|---|
| Professional Engineer – EPA Section 18(1)(a)(i) | Educated, trained and experienced to carry out complex, defined engineering work. | Graduate attributes acquired in education at NQF 8 level (560 credits). | Complex interaction between professions and disciplines; justify work outside codes, standards and procedures. |
| Professional Certificated Engineer – EPA Section 18(1)(a)(iii) | Educated, trained and experienced to carry out broadly defined engineering work. | Graduate attributes acquired in education at NQF 7 level (420 credits) and Government Certificate of Competency. | Interaction with other professions and disciplines; authorisation required to work outside codes, standards and procedures after conducting research and investigation; legal responsibility (OHS Act). |
| Professional Engineering Technologist – EPA Section 18(1)(a)(ii) | Educated, trained and experienced to carry out broadly defined engineering work | Graduate attributes acquired in education at NQF 7 level (420 credits) | Interaction with other professions and disciplines; authorisation required to work outside codes, standards and procedures after conducting research and investigation. |
| Professional Engineering Technician – EPA Section 18(1)(a)(iv) | Educated, trained and experienced to carry out well-defined engineering work | Graduate attributes acquired in education at NQF 6 level (280 to 360 credits) | Mainly working within a single discipline; strict adherence to codes, standards and procedures; repetitive work. |

| Category | Authority | Underpinning knowledge | Area of responsibility |
|---|---|---|---|
| Specified Category Specialist – EPA Section 18(1)(c) | Educated, trained and experienced to carry out specifically defined engineering work | Graduate attributes acquired in education at NQF 5 level (140 credits) | Working within a single discipline in a specific field; may be legally responsible for work. |

Finally, this guide applies to persons who:

- have completed the educational requirements for registration as either a Professional Engineer or a Professional Engineering Technologist and who are registered with the ECSA as such; or
- have completed recognised foreign equivalent educational requirements for registration as either a Professional Engineer or a Professional Engineering Technologist but are not registered with the ECSA **(Alternative Route Applicants)**;
- have embarked on a process of acceptable training under a registered **C&U** with a Mentor guiding the professional development process at each stage; and
- intend to adhere to the ECSA Code of Conduct, prohibiting the undertaking of engineering work for which the registered person is not qualified, trained or experienced.

## 3. PERSONS NOT REGISTERED AS CANDIDATE OR NOT BEING TRIANED UNDER A C&U

All Applicants for registration must present the same evidence of competence and be assessed against the same standards and requirements, irrespective of the development path followed. Application for registration as a Glazing Specialist is permitted without being registered as an Applicant Specified Category or without training under a C&U. Mentorship and adequate supervision are, however, key factors in effective development to the level required for registration. A C&U indicates that the company is committed to mentorship and supervision.

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

These requirements are written for the recent registered Professional Engineer (Pr. Eng) / Professional Engineering Technologist (Pr. Tech Eng) who is training and gaining experience towards Applicant Glazing Specialist registration. Mature applicants for Glazing Specialist registration may apply the requirements 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 applications for Glazing Specialist registration.

This training requirements document may be applied in the case of a person moving into a candidacy programme at a later stage that is at a level below that required for registration.

## 4. TRAINING OBJECTIVE

Glazing Specialists are professionally registered persons who develop design methodologies, commencing with the functional and legislative requirements of buildings to which the glazing is applied. The performance-based designs are developed based on theoretical academic knowledge and supported by design codes and standards where applicable. They apply scientific and engineering principles, rules (codes), legislative requirements and expert judgement, based on an understanding of the performance and performance limitations of glazing and how they affect and contribute to the building to which they are attached to meet structural, safety, security, aesthetic, longevity, water infiltration and energy performance of a building and how it contributes to the designed experience of that building.

To achieve ECSA Glazing Specialist registration, a training programme designed by the employer should achieve the following:

- Expose the applicants to Experience and Training, enabling them to apply engineering theory acquired during educational development to practical workplace situations for the prescribed period
- Incorporate an increasing level of responsibility to enable applicants to submit evidence in the Training and Experience reports of achieving the duration and the level detailed in Appendix B of this document (Degrees of Responsibility)

- Develop the engineering competency of applicants to cover the sub discipline-specific requirements referred to in **Section 8.8.2** of this document.

## 5. AREAS OF PRACTICE

Glazing Specialists form a collective group of designers who plan, design, organise and oversee the construction, operation, maintenance and management of installations and applications of glazing in buildings.

Glazing Specialists perform activities diligently, safely and cost effectively to mitigate the risks associated with glazing installations including the:

- design, production, checking, interpretation, evaluation and approval of glazing design
- inspection of building work regarding the compliance of glazing design in relation to all buildings containing glazing
- evaluation and testing of proposed and installed glazing systems
- inspection, approval, commissioning, signing off and subsequent maintenance of glazed systems and installations.

Typical tasks that Glazing Specialists may undertake include the following:

- **Research:** conduct research and develop specifically defined new or improved theories and methods related to the performance of glazing materials, glazing composites and their connections to buildings
- **Procurement:** develop a specification on the performance and aesthetic requirements of glazing to include in bills of quantity as well as to advise on the merits of completing tender submissions on compliance or deficiencies to the technical specification
- **Safety and environment:** assist in establishing control systems to ensure efficient functioning of infrastructure as well as safety and environmental protection
- **Operations:** organise and direct the maintenance and repair of existing glazing installations
- **Technical support:** analyse the behaviour of glazing materials when failure has occurred
- **Quality control and management:** assess and analyse the stability of glazing structures and test the behaviour and durability of materials and sub-assemblies used in the construction

- **Construction:** construction monitoring of the execution of the design elements according to the specifications and approved construction drawings.

The Glazing Specialist responsible for preparing the rational design or rational assessment (or both) of a glazing system must document all assumptions made and the form and size of the principal structural elements for a proposed system, detail all connections associated therewith and determine the construction and material specifications necessary to achieve the design intent.

Glazing Specialists:

- specify and verify suitable designs, test and verify that the tested product is matched by that installed on site
- design glazing systems that can withstand imposed loads to the building that cause stresses and strains associated with the building loads, while performing their function as a barrier
- design glazing to resist stresses and strains and to restrict structural loads (wind, point, line, seismic, buckling, dynamic loads, etc)
- design for thermal stress to insulate a building to withstand both hot and cold climates to meet energy efficiency requirements
- design glazing to prevent condensation formation on glass surfaces
- design for high winds and wind borne debris
- conduct assessment and establish cause of glazing failure characterisation of glazing failure
- assess and design glazing and framing systems to resist potential manual, ballistic and explosive threats
- design a glazing system for noise reduction, where required
- determine colour shift of a particular glazing material for approval by an interior designer
- design for serviceability limits - Glazing appearance specification including deflections, distortion and point and linear features
- design for relevant legislative requirements.

## 6. GLAZING SYSTEMS

Glazing Specialists are concerned with the application of scientific and engineering principles, rules (codes), legislative requirements and expert judgement, based on an understanding of the performance and performance limitations of glazing and how they affect and contribute to the building to which they are attached to meet structural, safety, security, aesthetic, longevity, water infiltration and energy performance of a building and how glazing contributes to the designed experience of that building.

Glazing is concerned with different types of material and components, which are presented in Table 2 below.

**Table 2: Different types of glazing material and components**

| Glass | Plastics |
|---|---|
| a) ordinary clear flat glass<br>b) patterned or obscure glass<br>c) special glass such as fire-retardant, glare-reducing, heat-absorbing, heat-reflecting, safety glass and wired glass<br>d) processed and enhanced glass such as toughened, laminated, laminated and toughened, edge preparations, cutouts and holes.<br>e) Double and multiple glazing units | a) polycarbonate<br>b) polyethylene terephthalate (PET)<br>c) polymethyl methacrylate (PMMA), also known as “acrylic”<br>d) polyethylene terephthalate, glycol modified (PETG)<br>e) poly(vinyl chloride) (PVC)<br>f) Glass reinforced plastic |

Glazing Specialists must develop design methodologies, commencing with the functional and legislative requirements of the building to which the glazing is applied. Thereafter, Rational Designers (Glazing Specialist) performance-based designs are developed based on theoretical academic knowledge, supported by design codes and standards where applicable.

Rational Designers (Glazing Specialist):

- understand the nature and characteristics of glazing, its strengths and limitations
- understand the interaction between the glazing material, its framing and fixing methods and their interaction with the principle structural elements of the building

- understand how runoff water (rain, cleaning, leaks, etc.) will be handled and directed away to avoid damage to building components
- anticipate and eliminate or manage interactions between materials of the glazing systems.

Glazing Specialists are essential to integrating these glazing components into the Built Environment without compromise to the architectural intent or the creation of a productive and efficient space that does not discriminate against those less fortunate.

The glazing methods and systems that Glazing Specialists should demonstrate knowledge and competence to include:

- Application of sealants and adhesives
- Use of flexible glazing compounds
- Use of preformed adhesive strip material
- Use of flush glazing, which includes:
    - finished surfaces (anodic, powder-coating finishes).
    - galvanized steel, in-situ surface coatings), unfinished surfaces (stainless steel, concrete and other materials)
- Surface preparation such as solvent cleaning, priming and sealing of porous surface
- Application of one-way vision
- Control of reflections in glazing materials, etc.

## 7. TRAINING IMPLICATIONS ON THE NATURE AND ORGANISATION OF THE INDUSTRY

### 7.1 Nature of training

The Applicant can be trained in line with the SANS 10137 as amended, the installation of glazing in buildings. This standard covers the design and installation of glazing and glazing materials used in buildings and is for applications described in SANS 10400.

The design methods described in the standard may represent only one of many methods of determining glazing thickness and strength requirements for a given situation. Glazing Specialists may use any method of calculation they deem fit for purpose provided such method

represents good engineering design practice, acceptable safety factors and deflections, and can be backed up by referring to reference material or test data.

Applicants must demonstrate the ability to select the type of glazing material and its characteristics. As part of demonstrating the application of theoretical knowledge, applicants must incorporate calculations with clearly defined inputs of the formulae used and detailed interpretation of the results obtained. Applicants must demonstrate how the calculated results have been used to provide the solution to the problem at hand and indicate the benefit to the project or the operating work environment.

Applicant Glazing Specialists must gain experience in solving a variety of problems in their work environment, and the solution to these problems must involve the use of fundamental engineering knowledge obtained at an institute of higher learning.

The problems that require a scientific and engineering approach in their solution are often encountered in the required work of Glazing Specialists. Throughout their training years, Applicants must actively seek opportunities to gain experience in the areas of defining, investigating, analysing and developing solutions to real-life engineering problems encountered in the workplace.

Applicants or prospective applicants for registration should be familiar with the requirements of the applicable standards for the category.

### 7.2 Process design

Glazing Specialists must demonstrate the ability to define, investigate and analyse specifically defined engineering problems (tasks), typified by the following performances:

7.2.1 Understand the activity as agreed to with the client

- Use personal experience and knowledge and an understanding of the employer's commercial position and available glazing resources to identify potential projects or opportunities and consider their technical viability
- Demonstrate ability to define in-house rational glazing safety design and to use this capability together with related expertise of other specialists to provide a total solution
- Analyse and clarify information, drawings, codes and procedures

- Demonstrate the ability to select the type of glazing material that will not deteriorate under normal circumstances
- Demonstrate the ability to interpret the engineering designs and drawings.

7.2.2 Be conversant with latest developments in the glazing field

Carry out initial professional development to remain abreast of key developments in the field of glazing, such as changes in regulations or in glazing practices, and be aware of key research/experimental programmes that are likely to have an influence in the field. Changes in regulations or industry practices will have an impact on the National Building Regulations and Building Standards Act, 103 of 1977 (see **SANS 10400N**).

7.2.3 Engage in the creative and innovative development of engineering technology

Engage in the creative and innovative development of engineering technology and continuous improvement systems to design an optimised glazing rational design that will perform equally well or better than pure code-related rules.

7.2.4 Develop and analyse alternative approaches

Develop and analyse alternative approaches to do the work and check impacts and sustainability of solutions.

### 7.3 Risk and impact mitigation

Glazing Specialists must meet the requirements for the safety and security of people and property while designing the glazing system. In addition to wind loads and fire protection, the following factors must be considered when selecting glazing materials:

- human impact
- burglary and vandalism
- armed attack.

Glazing Specialists must undertake engineering activities in a way that contributes to sustainable development and exercise sound judgement during specified engineering activities:

- Promote the considerations and actions required in engineering practice to improve, sustain and restore the environment
- Encourage the wise use of non-renewable resources through waste minimisation, recycling and the development of alternatives, where possible
- Strive to achieve the beneficial objectives of glazing design through minimising the consumption of raw materials and energy and designing sustainable management procedures
- Account for life-cycle implications with respect to how glazing designs affect the environment
- Understand and secure stakeholder involvement in sustainable development
- Use resources efficiently and effectively.

### 7.4 Engineering project management

Glazing Specialists must plan for effective project implementation, meet all legal and regulatory requirements and protect the health and safety of persons during their specified engineering activities through:

- identifying the factors affecting project implementation
- preparing and developing project proposals and negotiating contractual arrangements with customers, suppliers and partners to secure the employer's commercial position
- analysing and organising the provision of resources required to execute the work
- recognising and addressing the reasonably foreseeable social, cultural and environmental effects of specified engineering activities
- complying with international, national and local laws, regulations, by-laws and standards relating to glazing safety and emergency services to ensure end-to-end sustainable glazing safety solutions.

Glazing Specialists must demonstrate the ability to plan, budget, organise, direct and control tasks, people and resources by:

- setting work objectives and priorities including milestone outputs, project deadlines, quality standards and budgets

- organising project teams and exercising leadership over other engineers and technical and other personnel as appropriate
- monitoring and/or auditing tasks to ensure that work is executed as planned and determine appropriate corrective actions.

Glazing Specialists must demonstrate the ability to lead teams and develop staff to meet changing technical and managerial needs through:

- agreeing on objectives and work plans with teams and individuals
- contributing to the identification of the training needs of teams and individuals to respond to changing technical and managerial requirements and to further their professional progression
- developing external and work experience-related training plans for teams and individuals and identify and procure appropriate training activities and resources.

### 7.5 Undertake reviews of training effectiveness

Rational Designers (Glazing Specialist) must demonstrate the ability to manage implementation of design solutions and evaluate their effectiveness through:

- preparing documented proposals that clearly identify and describe the glazing solutions that have been engineered to satisfy the functional objectives of the project
- ensuring that any testing or proving requirements are discussed and that any potential problem areas are highlighted, with options for modifications or adaptions identified as necessary
- taking corrective action to overcome the shortcomings or omissions that are identified with the proposals
- determining the impact on glazing design solutions of factors such as construction, installation, commissioning, life-cycle implications, technical support, training of users and shifting user needs
- in consultation with affected parties, evaluating the issues that affect them and how resolution of these issues will influence the design.

### 7.6 Continuing professional development

Glazing Specialists registered by the ECSA are able to contribute to further their education, development and training regarding glazing practice to ensure competency and the acceptance of work responsibility. Participating in ECSA's candidacy scheme with the associated C&U, adhering to ECSA's continuing professional development (CPD) requirements and complying with the ECSA Code of Conduct will improve the service to the country and promote the standing of Glazing Specialists.

### 7.7 Production

Glazing Specialists must ensure that any material used in the glazing of any building is of a secure and durable type and is fixed in a manner and position that ensures that it will:

- safely sustain any structural actions as described in SANS 10160 series which can reasonably be expected and not allow penetration of water to the interior of the building
- be apparent, in the case of clear glazing, to any person approaching such glazing
- Resist fire to the limits stated by the fire engineer
- Ensure the building meets the energy efficiency requirements and all other requirements of the NBR of the glazing.

### 7.8 Operations and maintenance

Glazing Specialists must demonstrate understanding of repair and renovation glazing which complies with the provisions of the NBR, irrespective of the type of glazing used originally.

Glazing Specialists must demonstrate the ability to conduct a Rational Designer's assessment and make recommendations for repairs and maintenance.

## 8. DEVELOPING COMPETENCY

### 8.1 Contextual knowledge

Applicants are expected to be aware of the requirements of the engineering profession. Among the functions and services of the recognised VAs applicable to Glazing Specialists is the

provision of a broad range of contextual knowledge not only for Applicant Glazing Specialists but also through the full career path of Registered Glazing Specialists.

The practice area of Glazing Specialists identifies specific contextual activities that are considered essential in the competence development of Glazing Specialists.

The Panel Members of the ECSA, with its sub discipline-specific assessing team, performs a review of the portfolio of evidence of Applicant Glazing Specialists at the completion of the training period.

### 8.2 Functions performed

Special considerations must be given to the competencies specified in the following groups as describedin the Degree of Responsibility Scale presented in document **R-04-SC**:

- Responsibility Level A: Knowledge-based problem-solving
- Responsibility Level B: Management and communication
- Responsibility Level C: Identifying and mitigating the impacts of the engineering activity
- Responsibility Level D: Judgement and responsibility
- Responsibility Level E: Independent learning.

The progression of an Applicant's competency can be measured as indicated in **Appendix B**, which was developed to align the progression of Applicant Glazing Specialists with the Degree of Responsibility Scale. It should be noted that Applicant Glazing Specialists working at **Responsibility Level E** carry the responsibility for work performed that is appropriate to that of a Registered Person except that supervisor of an Applicant Glazing Specialist is accountable for that Applicant's recommendations and decisions.

### 8.3 Statutory

Applicants are expected to have a working knowledge of the following regulations, Acts and standards and how they affect their working environment:

- Occupation Health and Safety Act, 85 of 1993, as amended by Act 181 of 1993
- Environment Conservation Act, 73 of 1989, as amended by Act 52 of 1994 and Act 50 of 2003

- Labour Relations Act, 66 of 1995
- Building Regulations – National Building Regulations and Building Standards Act, 103 of 1977, as amended by Act, 49 of 1995
- SANS and other international standards such as ISO, EN, DIN or US Federal Standards. (Refer to Appendix C)
- National Building Regulations Act, 103 of 1977 etc.

Many other Acts that are not listed here may also be pertinent to the work environment of Applicant Glazing Specialists. Applicant Glazing Specialists are expected to have a basic knowledge of the applicable Acts and to investigate whether or not any Acts are applicable to the particular work environment.

### 8.4 Recommended formal learning activities

The following list of formal learning activities is a sample of useful courses:

- CPD courses on specific disciplines and equipment types
- Elementary project management
- Negotiation skills
- Risk analysis
- Quality systems
- Occupational health and safety
- Maintenance engineering
- Environmental impacts
- Report writing and communication
- Planning methods
- Facilities management, etc.

### 8.5 Best practice

There is no ideal training programme structure or unique sequencing that constitutes best practice. The training programme for each Applicant Glazing Specialist depends on the work opportunities available at the time for the employer to assign to the Applicant. It is suggested that Applicant Glazing Specialists work with their mentors to select appropriate training to gain

exposure to the eventual responsibility for design, installation, commissioning and/or maintenance of the glazing.

The training programme should be such that Applicant Glazing Specialists progress through the levels of work capability described in document **R-04-T&M-GUIDE-SC**, so that by the end of the training period, Applicant Glazing Specialists can perform individually and as team members, meeting the sub discipline-specific requirements (and the engineering outcomes for Alternative Route applicants) at the level required for registration and exhibiting the **Degree of Responsibility E**.

The nature of work and the degrees of responsibility defined in document **R-04-T&M-GUIDE-SC** are indicated in **Appendix B**.

Mentors and Glazing Specialist applicants must identify the level of responsibility at which an activity is compliant with and demonstrates the various requirements and if applicable, the outcomes. Evidence of a Applicant's activities is recorded on the appropriate system such that it meets the Requirements and, if applicable, the Training Elements indicated in **Appendix A**. ECSA will specify the applicable recording system in the Application for Registration form (usually a *Sub discipline-Specific Requirement Report* and for Alternative Route applicants, an *Engineering Report*, with the associated calculations, sketches, installation schedules, maintenance schedules, commission results, etc. for each selection that is applied for).

### 8.6 Realities

Generally, irrespective of the system type, it is unlikely that the period of training will be 3 years, the minimum time ECSA requires. Typically, it will be longer and will be determined by the availability of functions in the actual work situation among other concerns.

Each Applicant will effectively undertake a unique programme in which the various activities carried out at the sub discipline specific level are linked to the generic competency requirements presented in document **R-08-CS-GUIDE-SC** and to the **Compulsory Sub discipline-specific Requirements** that are to be met during the candidacy.

### 8.7 Moving into training programmes

The guide assumes that Applicant Glazing Specialists are supervised and mentored by persons who meet the requirements stated in document **R-04-T&M-GUIDE-SC**. In the case of a person changing from one training programme to another or moving into a training programme from a less structured environment, it is essential that the following steps are completed:

- Applicant Glazing Specialists must complete the Training and Experience Summary (TES) and the Training and Experience Report (TER) for the previous programme or unstructured experience. In the latter case, itis important to reconstruct the experience as accurately as possible. The TERs must be signed off.
- Alternative Route Glazing Specialist Applicants must complete the TES and the TERs for the previous programme or unstructured experience. In the latter case, it is important to reconstruct the experience as accurately as possible. The TERs must be signed off.
- On entering the new programme, the mentor and supervisor should review the Applicant Glazing Specialist's development while considering past experience and opportunities and the requirements of the new programme.
- The next phase of the Applicant's programme must be planned.
- The Applicant Glazing Specialist must complete the **Discipline-specific Requirements Report** (DSRR) on elements already covered during the initial part of the candidacy.

### 8.8 Programme structure and sequencing

8.8.1 Consideration for generalists, specialists, researchers and academics

The ECSA **R-08-CS-GUIDE-SC** documents adequately describe what is expected of persons whose formative development has not followed a conventional path, for example, academics, researchers, specialists and those who have not followed an Applicant training programme.

The overriding consideration is that irrespective of the route followed, the applicant must provide evidence of competence against the **Sub discipline-specific Requirements** and in the case of Alternative Route applicants, against the Standards.

8.8.2 Compulsory Sub discipline-specific Requirements to be met during candidacy

The industry has a critical need to identify people who are able to conduct the essential operations associated with the efficient and safe design, installation, commissioning, maintenance and inspection of glazing. An additional need exists to identify Competent Persons in Glazing Specialists accomplishing rational designs. This will lead to competence in the field of work and thereby add value to the industry and improve the country's economy. It will also lead to a balanced society in that learners will understand how the work they do fits into the greater engineering industry.

During candidacy, all Applicants assisted by mentors and supervisors must ensure that they are conversant with the practical knowledge set out in form **APP-REG-SC-RDGS** (part of the *Application for Registration* form) and submit evidence as such in the form of a Sub discipline-specific Requirements Report **APP-REG-SC-RDGS**.

During candidacy, **Alternative Route Applicants** must ensure they are conversant with the practical knowledge set out in form **ER-SC** (part of the *Application for Registration* form) and submit evidence as such in the form of an Engineering Report (**ER-SC**).

## REVISION HISTORY

| Revision number | Revision date | Revision details | Approved by |
|---|---|---|---|
| Rev. 0 Draft A | 23 Aug 2022 | Initial attempt at Applicant Rational Designers (Glazing Specialist) | working Group |
| Rev. 0 Draft B | 08 Nov 2022 | Draft review with the working group | RDDR and working Group |
| Rev. 0 Draft C | 26 Jan 2023 | Second Draft review with the working group | RDDR and working Group |
| Rev. 0 Draft D | 02 Jan 2023 | Review and Recommendation for Noting | Executive RPS: EL Nxumalo |
| Rev. 0 Draft E | 14 Feb 2023 | For progress and update | RPSC |
| Rev. 0 Draft F | 10 March 2023 | Third and final draft review Applicant Rational Designers (Glazing Specialist) | Working Group |
| Rev. 0 Draft F | 13 March 2023 | Document submitted to Registration BU for inputs and comments | RDDR and Registration BU |
| Rev. 0 Draft F | 14 March 2023 | Webinar to solicit inputs and comments from downstream stakeholders | RDDR and working Group |
| Rev. 0 Draft F | 24 March 2023 | Review inputs received from webinar | Working Group |
| Rev. 0 Draft F | 29 March 2023 | Review and Recommendation for Approval | Executive RPS: EL Nxumalo |
| Rev. 0 | 13 April 2023 | Approval | RPSC |
| Rev. 0 | 02 June 2023 | Noting | Council |

The Sub discipline-specific Training Guide for:

**Registration as a Rational Designers (Glazing Specialist) in Specified Category**

Revision 0 dated 13 April 2023 and consisting of 30 pages has been reviewed for adequacy by the Business Unit Manager and is approved by the Executive: Research Policy and Standards (RPS).

Business Unit Manager — 21 July 2023 Date

Executive: RPS — 25 July 2023 Date

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

## APPENDIX A: TRAINING ELEMENTS

This guide is written for Applicants who are training and gaining experience towards registration in this specified category. Mature Applicants for registration and Alternative Route may apply the guide retrospectively to identify possible gaps in their development.

**Synopsis:** An Applicant Glazing Specialist should achieve specific competencies at the prescribed level during his/her development towards registration and at the same time accept more and more responsibility as experience is gained. The outcomes achieved and established during the Candidacy phase should form the template for all engineering work performed after registration, regardless of the level of responsibility at any particular stage of an engineering career.

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

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

| Competency Standards for registration as a Specified Category Rational Designer | Explanation and responsibility level |
|---|---|
| **1. Purpose**<br>This standard defines the competence required for registration as an Applicant Glazing Specialists. Definitions of terms having particular meaning within this standard are given in the text, at the beginning of the document. | Discipline-specific Training Guides (DSTGs) give context to the purpose of the Competency Standards. Registered Rational Designers (Glazing Specialist) operate within the nine disciplines recognised by the ECSA. Each discipline can be further divided into sub disciplines and finally into specific workplaces or competency areas. The DSTGs are used to facilitate experiential development towards ECSA registration and assist in compiling the required portfolio of evidence (specifically the Engineering Report in the application form).<br>**Note:** The training period must be used to develop the competence of the trainee towards achieving the standards presented below at the responsibility level indicated (mainly Level E: Performing). (Refer to Table 4 in document **R-04-T&M-GUIDE-SC**). |
| **2. Demonstration of competence**<br>Competence must be demonstrated within specifically defined engineering problems by integrated performance of the outcomes defined in Section 3 below at the level defined for each outcome. Required contexts and functions may be specified in the applicable Sub discipline-specific Training Requirements.<br>Activities include planning; investigation and problem resolution; improvement of materials, components, systems or processes, engineering operations, maintenance, project management, development and commercialisation. | Engineering activities can be approximately divided into the following:<br>• 5% Specifically defined(Professional Engineers)<br>• 5% Broadly defined (Professional Engineering Technologists)<br>• 10% Well-defined (Professional Engineering Technicians)<br>• 15% Specifically defined (Registered Specified Categories including Rational Designers (Glazing Specialist))<br>• 20% Skilled Worker (Engineering Artisan)<br>• 45% Unskilled Worker (Artisan Assistant)<br>The activities can be in-house or contracted out; evidence of integrated performance can be submitted irrespective of the situation. |

| Competency Standards for registration as a Specified Category Rational Designer | Explanation and responsibility level |
|---|---|
| | For Applicant Glazing Specialists, research, development and commercialisation happen frequently in some work areas and are seldom encountered in others. |
| **3. Outcomes to be satisfied** | **Explanation and Responsibility Level** |
| **Group A: Engineering problem-solving** | |
| **Outcome 1:**<br>Define, investigate and analyse *specifically defined* engineering problems (tasks). | **Responsibility Level E**<br>Analysis of an engineering problem means the 'separation into parts possibly with comment and judgement'. |
| **Competency indicators:** A structured analysis of specifically defined rational design problems typified by the following performances within the competency area is expected:<br>1.1 State how <u>you</u> interpreted the work instruction received, checking with your client or supervisor if your interpretation is correct.<br>1.2 Describe how <u>you</u> analysed, obtained and evaluated further clarifying information and if the instruction was revised as a result. | To perform an engineering task, Applicant (Glazing Specialist) will typically receive an instruction from a senior person (customer) to do the task and must conduct the following:<br>1.1 Ensure that the instruction is complete, clear and within his/her capability and that the person who issued the instruction agrees with his/her interpretation.<br>1.2 Ensure that the instruction and information to do the work is fully understood and complete, including the engineering theory needed to understand the task and to carry out and/or check calculations and the acceptance criteria. If needed, supplementary information must be gathered, studied and understood. |
| **Range Statement:** The problem (task) may be part of a larger engineering activity or may be stand alone. The design problem is amenable to solution by specific techniques practised regularly. This outcome is concerned with the understanding of a problem: Outcome 2 is concerned with the solution. | **Please refer to section 6 to 9 of the Sub discipline-specific Training Requirements document above**. |

| Competency Standards for registration as a Specified Category Rational Designer | Explanation and responsibility level |
|---|---|
| **Outcome 2:**<br>Design or develop (plan) sustainable solutions to *specifically defined* engineering problems (tasks). | **Responsibility Level C**<br>Design means 'drawing or outline from which something can be made'.<br>Develop means 'come or bring into a state in which it is active or visible'. |
| **Competency indicators:** This outcome is normally demonstrated after a problem analysis, as defined in Outcome 1. Working systematically to synthesise a solution to a *specifically-defined* problem typified by the following performances is expected:<br>2.1 Describe how <u>you</u> designed or developed and analysed alternative approaches to do the work. (Impacts and sustainability checked. Calculations attached).<br>2.2 State <u>your</u> final solution to perform the work, client or supervisor in agreement. | The task given must be fully understood and interpreted and solutions developed (designed) to execute. Synthesis of a solution means 'the combination of separate parts, elements, substances, etc. into a whole or into a system' by the following:<br>2.1 More than one way to conduct an engineering task or to solve a problem should always be developed (designed), and a costing and impact assessment for each alternative must be included. All the alternatives must meet the requirements set out by the instruction received, and the theoretical calculations to support each alternative must be done and submitted as an attachment. The alternatives must be within the imposed legal boundaries.<br>2.2 In some cases, the Applicant (Glazing Specialist) will not be able to support proposals with the complete theoretical calculation to substantiate every aspect and in these cases, he/she must refer his/her alternatives to a Professional for scrutiny and support**. The alternatives and the recommended** alternative must be convincingly detailed to win customer support for the alternative that is recommended. Selection of alternatives may be based on tenders submitted, with the summited alternatives deviating from those specified. |
| **Range statement:** The solution conforms to specific established methods, techniques or procedures within the *specifically-defined* competency area. Engineering should not only look to decrease impacts but also to restore and regenerate through design. | Applying theory to *specifically-defined engineering work* is done in a way that has been used before, probably developed by experienced Professionals in the past and documented in written procedures, specifications, drawings, models, examples, etc. Applicant Glazing Specialists must seek approval and engineering verification for any deviation from these established methods. |

| Competency Standards for registration as a Specified Category Rational Designer | Explanation and responsibility level |
|---|---|
| **Outcome 3:**<br>Comprehend and apply knowledge embodied in established specific engineering practices and knowledge specific to the field in which he/she practises. | **Responsibility Level E**<br>Comprehend means 'to understand fully'. The jurisdiction in which Applicant Glazing Specialists practises is given in section 6 to 9 of the applicable Sub discipline-specific Training Guide above. |
| **Competency indicators:** This outcome is normally demonstrated in the course of the design, investigation or operations confined to the competency area.<br>3.1 State which high-level engineering standard procedures and systems you used to execute the work and how high-level theory was applied to understand and/or verify these procedures.<br>3.2 Give your theoretical calculations and/or reasoning on why the application of this theory is considered correct (actual examples). | Design (development) work for Applicant Glazing Specialists is mainly to utilise, configure, certify, test, verify, etc. manufactured components or proven engineering or management systems, and to design (develop) work using an existing design (development) as an example. Applicant Glazing Specialists apply existing codes, policies and procedures in their design (developmental) work. Investigations are on specifically defined incidents, and condition monitoring and operations are mainly on controlling, maintaining and improving engineering systems and operations.<br>3.1 The understanding of specifically defined procedures and techniques must be based on fundamental mathematical, scientific and engineering knowledge. Specific procedures and techniques applied to do the work accompanied by the underpinning theory must be given.<br>3.2 Calculations confirming the correct application and utilisation of equipment and/or systems listed in the Sub discipline-Specific Training Guide above must be done on practical specifically-defined activities. Reference must be made to standards and procedures used and how they were derived from theory. |
| **Range statement:** Applicable knowledge includes the following:<br>a) Technical knowledge that is applicable to the practice area irrespective of location and supplemented by locally relevant knowledge, for example, established properties of local materials. | a) The specific location of the task to be executed is the most important determining factor in the layout, design and utilisation of equipment and/or systems. A combination of educational knowledge and practical experience must be used to substantiate decisions taken, including a comprehensive study of the laws, policies, procedures, standards, environment, manpower, materials, components and projected customer requirements and expectations. |

| Competency Standards for registration as a Specified Category Rational Designer | Explanation and responsibility level |
|---|---|
| b) A working knowledge of interacting disciplines confined to the competency area. Codified knowledge in related areas such as finance, statutory, safety, management and sustainability.<br>c) Jurisdictional knowledge includes legal and regulatory requirements together with prescribed codes of practice. | b) Despite having a working knowledge of interacting disciplines, Applicant Glazing Specialists must appreciate the importance of working with specialists such as civil engineers on structures and roads, mechanical engineers on fire protection equipment, architects on buildings and electrical engineers on communication equipment. The codified knowledge in the related areas means understanding and working to the requirements set out by specialists in areas such as those mentioned.<br>c) Jurisdictional in this instance means 'having the authority' and Applicant Glazing Specialists must adhere to the terms and conditions associated with each task undertaken. They may even be appointed as the 'responsible person' for specific duties in terms of the OHS Act. |
| **Outcome 4:**<br>Manage part or all of one or more *specifically-defined* engineering activities. | **Responsibility Level E**<br>Manage means 'control'. |
| **Competency indicators:** The display of personal and work process management abilities within the competency area is expected:<br>4.1 State how <u>you</u> managed yourself, priorities, processes and resources in doing the work (e.g., bar chart)<br>4.2 Describe <u>your</u> role and contribution in the work team. | In engineering operations and projects, Applicant Glazing Specialists will typically be given the responsibility to carry out specific tasks and/or complete projects.<br>4.1 Resources are usually subdivided based on availability and are controlled by a work breakdown structure and scheduling to meet deadlines. Quality, safety and environmental management are important aspects.<br>4.2 Depending on the task, the Applicant Glazing Specialist can be the manager, team leader or a team member and can supervise appointed contractors. |
| **Outcome 5:**<br>Communicate clearly with others in the course of his/her *specifically-defined* engineering activities. | **Responsibility Level E** |

| Competency Standards for registration as a Specified Category Rational Designer | Explanation and responsibility level |
|---|---|
| **Competency indicators:** Demonstrates effective communication by the following:<br>5.1 State how you presented your point of view and compiled reports after completion of the work.<br>5.2 State how you compiled and issued instructions to entities working on the same task. | 5.1 Refer to Range Statement for Outcomes 4 and 5. Presentation of point of view mostly occurs in meetings and discussions with the immediate supervisor.<br>5.2 Refer to Range Statement for Outcomes 4 and 5. |
| **Range statement for outcomes 4 and 5:** Management and communication in *specifically-defined engineering* involves the following:<br>a) Planning activities<br>b) Organising activities<br>c) Leading activities<br>d) Implementing activities<br>e) Controlling activities<br>Communication relates to technical aspects and wider impacts of professional work. Audiences include peers, other disciplines, clients and stakeholders. Appropriate modes of communication must be selected. The Specified Category Specialist is expected to perform the communication functions confined to the competency area reliably and repeatedly. | a) Planning means 'the arrangement for doing or using something, considered in advance'.<br>b) Organising means 'put into working order; arrange in a system; make preparations for'.<br>c) Leading means to 'guide the actions and opinions of; influence; persuade'.<br>d) Implementing means to 'carry an undertaking, agreement or promise into effect'.<br>e) Controlling means the 'means of regulating, restraining, keeping in order; check'.<br>Applicant Gazing Specialists participate in writing or adhere to specifications for the purchase of materials and/or work to be done, make recommendations on tenders received, place orders and variation orders, write work instructions, report back on work done, draw, correct and revise drawings, compile test reports, use operation and maintenance manuals to write or apply work procedures, write inspection and audit reports, write commissioning reports, prepare and present motivations for new projects, compile budgets, report on studies done and calculations carried out, report on customer requirements, report on safety incidents and risk analysis, report on equipment failure, report on proposed system improvement and new techniques, report back on cost control, report on environmental impact and sustainability, etc. |

| Competency Standards for registration as a Specified Category Rational Designer | Explanation and responsibility level |
|---|---|
| | |
| **Group C: Risk and impact mitigation** | **Explanation and responsibility Level** |
| **Outcome 6:**<br>Recognise the reasonably foreseeable social, cultural, environmental and sustainability effects of *specifically-defined* engineering activities. | **Responsibility Level D**<br>Social means 'people living in communities; of relations between persons and communities'.<br>Cultural means 'all the arts, beliefs, social institutions, etc. characteristic of a community'. Environmental means 'surroundings, circumstances, influences".<br>Sustainable is defined in the definitions below. |
| **Competency indicators:** This outcome is normally displayed in the course of analysis and the solution of problems within the competency area:<br>6.1 Describe the social, cultural, environmental impact and long-term sustainability of the engineering activity<br>6.2 State how you communicated mitigating measures to affected parties and acquired stakeholder engagement. | 6.1 Engineering significantly affects the environment (e.g., servitudes, expropriation of land, excavation of trenches with associated inconvenience, borrow pits, dust and obstruction, street and other crossings, power dips and interruptions, visual and noise pollution, malfunctions, oil and other leaks, electrocution of human beings, detrimental effect on animals and wild life, dangerous rotating and other machines and demolishing of buildings).<br>6.2 Mitigating measures taken may include environmental impact studies, environmental impact management, community involvement and communication, barricading and warning signs, temporary crossings, alternative supplies (ring feeders and bypass roads), press releases and compensation paid. |
| **Outcome 7:**<br>Meet all legal and regulatory requirements, protect the health and safety of persons and adhere to sustainable practices in the course of his/specifically-*defined* engineering activities. | **Responsibility Level E** |

| Competency Standards for registration as a Specified Category Rational Designer | Explanation and responsibility level |
|---|---|
| **Competency indicators:**<br>7.1 List the major laws and regulations applicable to this particular activity and how sustainability practices and health and safety matters were handled.<br>7.2 State how you obtained advice regarding risk management for the work and elaborate on the risk management system applied. | 7.1 The OHS Act is supplemented by a variety of parliamentary Acts, regulations, local authority by-laws, standards and codes of practice. Places of work may have standard procedures, instructions, drawings and operation and maintenance manuals available. Depending on the situation (emergency, breakdown, etc.), these documents are consulted before work is commenced and during the activity.<br>7.2 It is advisable to attend a Risk Management (Assessment) course and to investigate and study the materials, components and systems used in the workplace. The Applicant Glazing Specialist seeks advice from knowledgeable and experienced specialists if any doubt exist that safety and sustainability cannot be guaranteed. |
| **Range statement for outcomes 6 and 7:** Impacts and regulatory requirements include the following:<br>a) Impacts to be considered are generally those identified within the established methods, techniques or procedures used in the specific practice area.<br>b) Regulatory requirements are prescribed.<br>c) Apply prescribed risk management strategies.<br>d) Consider effects to be and define methods used.<br>e) Prescribe safe and sustainable materials, components and systems.<br>f) Prescribe maintenance protocols.<br>g) Persons' health and safety are to be protected both inside and outside the workplace. | a) The impacts will vary substantially with the location of the task (e.g., the impact of laying a cable or pipe in the main street of town will be entirely different to the impact of construction in a rural area.) The methods, techniques and procedures will differ accordingly and are identified and studied by the Applicant Glazing Specialist before starting the work.<br>b) The Safety Officer and/or the Responsible Person appointed in accordance with the OHS Act usually confirms or checks that the instructions are in line with regulations. The Applicant Glazing specialist is responsible for making certain that this is done and if not, to establish which regulations apply and ensure that they are observed. Usually, the people working on site are strictly controlled with health and safety, but the Applicant Glazing Specialist checks that this is done. Tasks and projects are mainly carried out where contact with the public cannot be avoided, and safety measures such as barricading and warning signs must be used and maintained.<br>c) Risks are mostly associated with elevated structures, subsidence of soil, electrocution of human beings, moving parts on machinery, fraud and corruption, and theft. Risk-management strategies |

| Competency Standards for registration as a Specified Category Rational Designer | Explanation and responsibility level |
|---|---|
| | are usually designed by more senior staff but are understood and applied by the Applicant Glazing specialist.<br>d) Effects associated with risk management are mostly well known if not obvious, and the methods used to address, these effects are clearly defined.<br>e) Usually, the safe and sustainable materials, components and systems are prescribed by Registered Professionals or other specialists. It is the responsibility of the Applicant Glazing specialist to use his/her knowledge and experience to check and interpret what is prescribed and to report anything with which he/she is not satisfied.<br>f) Draw up maintenance systems and procedures from the Codes of Practice and the Manufacturer's Instructions.<br>g) Staff working on the task or project and persons affected by the engineering work being carried out. |
| **Group D: Act ethically, Exercise judgement and Take responsibility and** | **Explanation and Responsibility Level** |
| **Outcome 8:**<br>Conduct engineering activities ethically. | **Responsibility Level E**<br>Ethically means 'science of morals; moral soundness'.<br>Moral means 'moral habits; standards of behaviour; principles of right and wrong'.<br>Systematic means 'methodical; based on a system'. |
| **Competency indicators:** Sensitivity to ethical issues and the adoption of a systematic approach to resolving these issues is expected: | |

| Competency Standards for registration as a Specified Category Rational Designer | Explanation and responsibility level |
|---|---|
| 8.1 State how you identified ethical issues and affected parties and their interests and indicate the actions you took when a problem arose.<br>8.2 Confirm you are conversant and in compliance with the ECSA Code of Conduct and why this is important in your work. | 8.1 Ethical problems that can occur include tender fraud, payment bribery, alcohol abuse, sexual harassment, absenteeism, favouritism, defamation, fraudulent overtime claims, fraudulent expenses claimed, fraudulent qualifications and misrepresentation of facts.<br>8.2 The ECSA Code of Conduct as per the ECSA website is known and observed. Give applicable examples. |
| **Outcome 9:**<br>Exercise sound judgement in the course of *specifically-defined* engineering activities. | **Responsibility Level E**<br>Judgement means 'good sense: ability to judge'. |
| **Competency indicators:** Exhibition of judgement is expected by the following**:**<br>9.1 State the factors applicable to the work, their interrelationship and how you applied the most important factors.<br>9.2 Describe how you foresaw work consequences and evaluated situations in the absence of full evidence. | 9.1 The extent of a project or task given to an Applicant Glazing specialist characterised by the number of factors and their resulting interdependence. The Applicant Glazing Specialist must seek advice if educational and/or experiential limitations are exceeded. Examples of the main engineering factors applied must be given.<br>9.2 Taking risky decisions will lead to equipment failure, excessive installation and maintenance costs, damage to persons and property, bankruptcy, poor service delivery, etc. Give examples. |
| **Range statement for outcomes 8 and 9:** Judgement is expected both within the application of the Applicant's category, specific methods and techniques and specific procedures and in assessing their immediate impacts. Judgement in decision-making involves:<br>a) taking limited risk factors into account, some of which may be ill-defined; | In engineering, about 15% of the activities can be classified as specifically defined. In such activities, the Applicant (Glazing Specialist) uses standard procedures, codes of practice, specifications, etc. Judgment must be displayed to identify any activity falling outside the range of the Glazing Specialists as defined above:<br>a) Seeking advice when risk factors exceed his/her capability.<br>b) Consequences outside the immediate work contexts (e.g. long-term) not normally handled. |

| Competency Standards for registration as a Specified Category Rational Designer | Explanation and responsibility level |
|---|---|
| b) taking consequences in the immediate work contexts into account; or<br>c) taking the identified set of interested and affected parties with defined needs into account. | c) Interested and affected parties with defined needs outside the parameters of the Applicant Glazing Specialist to be taken into account. |
| **Outcome 10:**<br>Be responsible for making decisions on part or all of one or more specifically-defined engineering activities. | **Responsibility Level E**<br>Responsible means 'legally or morally liable for carrying out a duty; for the care of something or somebody in a position where one may be blamed for loss, failure, etc.' |
| **Competency indicators:** Responsibility is displayed by the following performance:<br>10.1 Show how <u>you</u> used high-level theoretical calculations to justify decisions taken in doing engineering work. (Attach actual calculations).<br>10.2 State how <u>you</u> sought responsible advice on any matter falling outside your own education and experience.<br>10.3 Describe how <u>you</u> took responsibility for <u>your</u> own work and evaluated any shortcomings in <u>your</u> output | 10.1 The calculations, for example, fault levels, load calculations, losses, and return on investment are done to ensure that the correct material and components are used<br>10.2 The Applicant Glazing Specialist does not operate on tasks outside the Glazing Specialist range and consults professionals if elements of the tasks to be done are beyond his/her education and experience (e.g., power system stability, legal actions).<br>10.3 This is, in the first instance, continuous self-evaluation is to ascertain that the task given is done correctly, on time and within budget. Continuous feedback to the originator of the task instruction and corrective action if necessary forms an important element. |
| **Range statement:** Responsibility must be discharged for significant parts of one or more *spcifically-defined* engineering activities. | The responsibility is mostly allocated within a team environment, with increasing designation as experience is gathered. |
| **Note 1:** Responsibility for the evaluation of work in a supervisory capacity. | |

| Competency Standards for registration as a Specified Category Rational Designer | Explanation and responsibility level |
|---|---|
| **Group E: Initial Professional Development (IPD)** | **Explanation and Responsibility Level** |
| **Outcome 11:**<br>Undertake sufficient independent learning activities to maintain and extend competence. | **Responsibility Level D** |
| **Competency indicators:** Self-development typically managed by the following:<br>11.1 Provide the strategy that you adopted independently to enhance the professional development (IPD report).<br>11.2 Be aware of the philosophy of the employer regarding professional development. | 11.1 If possible, a specific field of the sub discipline is chosen, available developmental alternatives are established, a programme is drawn up (in consultation with employer if costs are involved), and available options are investigated to expand knowledge into additional fields.<br>11.2 Record keeping must not be left to the employer or to any other person. The trainee must manage his/her own training independently, taking initiative and being in charge of experiential development towards Glazing Specialist registration. Knowledge of the employer's policy and procedures on training is essential. |
| **Range statement**: Professional development involves the following:<br>a) Taking ownership of own professional development.<br>b) Planning own professional development strategy.<br>c) Selecting appropriate professional development activities.<br>d) Recording professional development strategy and activities while displaying independent learning ability. | a) This is your professional development, not that of the organisation for which you are working.<br>b) In most places of work, training is seldom organised by a training department. It is the responsibility of the Applicant Glazing Specialist to manage his/her own experiential development. Applicant Glazing Specialist frequently find themselves at a standstill and are left doing repetitive work. If self-development is not self-driven, success is unlikely.<br>c) Preference must be given to engineering development rather than developing soft skills.<br>d) Developing a learning culture in the workplace environment of Applicant Glazing Specialist is vital to their success. Information is readily available, and most senior personnel in the workplace are willing to mentor if approached. |

## APPENDIX B: PROGRESSION THROUGHOUT THE TRAINING PERIOD

| Degree of responsibility | Nature of work | Responsibility of Applicant to Supervisor | Extent 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 immediate quality of work. | Candidate articulates own reasoning and compares it with that of supervisor |
| **E: Performing** | Works in team without supervision, recommends work outputs, responsible but not accountable. | Level of responsibility to supervisor is appropriate to a registered person; supervisor is accountable for candidate's decisions. | Candidate takes on problem solving without support – at most, limited guidance. |

## APPENDIX C: REGULATIONS AND SPECIFICATIONS

| **Specific Rational Designers (Glazing Specialist) types recognised for registration as a Rational Designers (Glazing Specialist) (equivalent standard/code of practice also applicable)** | |
|---|---|
| **No.** | **Applicable Standard** |
| 1. | • ASTM C 1087, Standard test method for determining compatibility of liquid-applied sealants with accessories used in structural glazing systems.<br>• SANS 110, *Sealing compounds for the building industry, two-component, polysulphide base*.<br>• SANS 1077, Sealing compounds for the building and construction industry, two-component, polyurethane-base.<br>• SANS 1305, *Sealing compounds for the building industry, one-component, silicone-rubber-base*. |
| 2. | • ASTM E 1300a, *Standard practice for determining load resistance of glass in buildings*.<br>• BS EN 673, Glass in building – Determination of thermal transmittance (U-value) – Calculation<br>• method.<br>• SANS 10160-1, Basis of structural design and actions for buildings and industrial structures – Part 1: Basis of structural design.<br>• SANS 10160-2, Basis of structural design and actions for buildings and industrial structures –Part 2: Self-weight and imposed loads.<br>• SANS 10160-3, Basis of structural design and actions for buildings and industrial structures –Part 3: Wind actions. |
| 3. | • BS 952-1, Glass for glazing – Classification.<br>• SANS 17, Glass and plastics in furniture.<br>• SANS 10400-A, The application of the National Building Regulations – Part A: General principles and requirements.<br>• SANS 10400-N, The application of the National Building Regulations – Part N: Glazing.<br>• SANS 50572-1/EN 572-1, Glass in building – Basic soda lime silicate glass products – Part 1: Definitions and general physical and mechanical properties. |
| 4. | • DIN 32622, Aquariums of glass – Safety requirements and testing.<br>• SANS 1263-1, Safety and security glazing materials for buildings – Part 1: Safety performance of glazing materials under human impact.<br>• SANS 1263-2, Safety and security glazing materials for buildings – Part 2: Burglar-resistant and vandal-resistant glazing materials. |

| Specific Rational Designers (Glazing Specialist) types recognised for registration as a Rational Designers (Glazing Specialist) (equivalent standard/code of practice also applicable) | |
|---|---|
| **No.** | **Applicable Standard** |
| | • SANS 1263-3, Safety and security glazing materials for buildings – Part 3: Bullet-resistant glazing materials. |
| 5. | • ISO 7391-2, Plastics – Polycarbonate (PC) moulding and extrusion materials – Part 2: Preparation of test specimens and determination of properties.<br>• SANS 10177-5, Fire-testing of materials, components and elements used in buildings – Part 5: Non-combustibility at 750 °C of building materials. |
| 6. | • ISO 48, Rubber, vulcanized or thermoplastic – Determination of hardness (hardness between 10 IRHD and 100 IRHD).<br>• SANS 680, Glazing putty for wooden and metal window frames.<br>• SANS 999, Anodized coatings on aluminium (for architectural applications).<br>• SANS 1274, Coatings applied by the powder-coating process. |
| 7. | • SANS 50572-1/EN 572-1, Glass in building – Basic soda lime silicate glass products – Part 1: Definitions and general physical and mechanical properties. |
| 8. | • SANS 10137:2011 Edition 4, SOUTH AFRICAN NATIONAL STANDARD<br>• The installation of glazing in buildings |