



Surveyor

Competency Frameworks

Surveyors Act 2003 s 39

Document Identifier:	SBQ-CF-0103
Version Number:	V3.00
Approval/Review Date:	20/08/2007

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Introduction

This document describes the Competency Framework for registration as a Surveyor as prescribed under section 39 of the Surveyors Act 2003

The competency framework describes the competency Units, Elements and Descriptors that are required to be met for registration as a surveyor. The competency framework describes the performance that the candidate is required to display. Competency is developed through the appropriate combination of qualifications, skills, knowledge and experience.

Definitions

Unit of Competency (Unit): A major segment of the overall competency of a profession, typically representing a major function, role or field of activity.

Element of Competency (Element): A subdivision of a unit of competency into an observable function or activity.

Performance Criteria (Descriptors): An indicative list of the aspects of professional performance that would be regarded as evidence of competent professional performance in the work place in an element of competency.

With Guidance: The performance of the descriptor is achieved by the applicant under the direction of a competent supervisor. The applicant need not be able to perform the activity without requesting help in planning and execution.

Under Supervision: The performance of the descriptor is achieved by the applicant without direct supervision of each step; however the result of the activity cannot be used unless it has been checked by a competent supervisor.

Interpretation of the Framework

The competencies for Surveyors will be demonstrated by experienced professional surveyors practising in any sector of the market. The competencies are applicable to Surveyors in all fields of surveying.

Surveyors in the public, private or tertiary sectors will be practising as competent professionals demonstrating expertise and professionalism. They will have demonstrated sound technical competence and management skills during their years of professional experience.

Surveyors at this level will accept responsibility for all professional work undertaken within their areas of expertise. However, they must recognise complex or critical situations where professional guidance is required. Professional Surveyors will be expected to progressively develop their levels of competency and accept a commensurate increase in professional responsibility.

Competency Requirements for Surveyor

An Applicant will need to demonstrate competency in the following Units:

- Unit 1: Professional Practice
- Unit 2: Collection of Data and Information
- Unit 3: Management of Data and Information
- Unit 4: Presentation of Information
- Unit 5: Business Management and Supporting Quality Assurance Programs
- Unit 6: Communications
- Unit 7: Spatial Reference Systems and Core Data Bases

And at least one of the following Units:

- Unit 8: Land Administration and Property Development
- Unit 9: Controlling the Location of Developments
- Unit 10: Research Development and Commercialisation
- Unit 11: Education and Training

Competency Table for Surveyor

Unit 1: Professional Practice

Surveyors will have demonstrated high levels of professionalism during their years of professional experience. They will demonstrate increasing levels of professionalism in all aspects of professional practice and a sound understanding of the profession's policy on ethics and professional practice.

Element	Descriptors
1.1 Undertake a program of tertiary education	<p>Applicants will need to demonstrate that they :</p> <ul style="list-style-type: none"> i. Have completed a course of study of at least three years fulltime duration acceptable to the Surveyors Board of Queensland or have been previously registered as a Surveyor by the Surveyors Board of Queensland
1.2 Advance the science of surveying and the image of surveyors	<p>Applicants will need to demonstrate that they :</p> <ul style="list-style-type: none"> i. Conduct themselves in a manner that enhances the profession ii. Seek appropriate reward through merit and quality of performance <p>Applicants will need to demonstrate that they are able to :</p> <ul style="list-style-type: none"> iii. Contribute to promoting surveyors and surveying iv. Adopt advanced technology to improve service
1.3 Fulfil community service obligations	<p>Applicants will need to demonstrate that they :</p> <ul style="list-style-type: none"> i. Can explain why surveyors have professional responsibilities to government and the community ii. Practice impartiality and objectivity in decision making iii. Place responsibilities for the welfare and safety of the community above sectional interests <p>Applicants will need to demonstrate that they are able to :</p> <ul style="list-style-type: none"> iv. Pursue fair and equitable solutions that rank community interests appropriately with client and personal interests v. Participate in community affairs vi. Provide specialist expertise to identify unqualified information that could mislead the community
1.4 Follow an accepted code of professional conduct and ethics	<p>Applicants will need to demonstrate that they :</p> <ul style="list-style-type: none"> i. Understand and can explain in context the profession's code of ethics ii. Apply a high code of personal conduct iii. Understand and can explain the Surveyors Board of Queensland's <i>Code of Practice for Surveyors</i> <p>Applicants will need to demonstrate that they are able to :</p> <ul style="list-style-type: none"> iv. Carry out professional activities in accordance with the code of ethics v. Comply with legal requirements and obligations vi. Comply with professional responsibilities

<p>1.5 Undertake a program for personal professional development and continuing education</p>	<p>Applicants will need to demonstrate that they :</p> <ul style="list-style-type: none"> i. Attend the profession’s continuing professional development programs ii. Pursue continuous improvement in performance iii. Seek out and read literature relevant to surveying practice
<p>1.6 Understand and apply sustainable development and environmental principles</p>	<p>Applicants will need to demonstrate that they are able to :</p> <ul style="list-style-type: none"> i. Apply the profession’s policy on environmental matters ii. Identify complex environmental issues encountered in regular practice and seek guidance from qualified specialists iii. Can explain the likely impact of developments on the life styles, cultures and heritage of all sections of the community iv. Contribute to the resolution of environmental issues v. Show how the environment can be protected and sustainable development promoted vi. Explain land degradation issues and conservation practices
<p>1.7 Accept responsibility for professional activities</p>	<p>Applicants will need to demonstrate that they are able to :</p> <ul style="list-style-type: none"> i. Identify and manage potential risks and liabilities ii. Understand and explain the likely impacts of work undertaken <p>Applicants will need to demonstrate that they :</p> <ul style="list-style-type: none"> iii. Work within the limits of personal skills and expertise and seek professional advice and support for more complex work
<p>1.8 Accept responsibility for workplace health and safety</p>	<p>Applicants will need to demonstrate that they are able to :</p> <ul style="list-style-type: none"> i. Practice and enforce correct occupational health and safety procedures ii. Institute and maintain a safe work environment iii. Develop daily job safety profiles and ensure compliance

Unit 2: Collection of Data and Information

Surveyors will be competent in collecting data and information that are relevant to their fields of surveying and will be accountable for the outcomes of work personally carried out or carried out under their direct supervision.

Element	Descriptors
<p>2.1 Collect data by measurement</p>	<p>Applicants will need to demonstrate that they are able to :</p> <ul style="list-style-type: none"> i. Use the typical measuring technology available ii. Collect data by indirect methods iii. Clarify client needs and expectations iv. Evaluate the various measurement methods and procedures available for data collection and measurement v. Assess the effectiveness of the measurement methodology used vi. Ensure measurements are legally traceable

<p>2.2 Search and acquire existing data</p>	<p>Applicants will need to demonstrate that they :</p> <ul style="list-style-type: none"> i. Understand and can explain the importance of historical records <p>Applicants will need to demonstrate that they are able to :</p> <ul style="list-style-type: none"> ii. Extract required information from relevant geographic and land information records, survey data bases, and general information depositories iii. Evaluate the integrity and value of stored data and information and assess its relevance to client needs iv. Transfer data from existing to new data bases v. Acquire information in an orderly and systematic manner
<p>2.3 Use modern surveying technologies to collect data</p>	<p>Applicants will need to demonstrate that they are able to :</p> <ul style="list-style-type: none"> i. Define coordinates systems likely to be encountered by GNSS users and calculate GNSS coordinates ii. Discuss the principles of GNSS observations iii. Make observations using a GNSS receiver iv. Explain GNSS observations techniques, and calculate and evaluate levels of accuracy associated with GPS observations v. Identify error sources in GNSS observations, and explain the uses and critical factors of differential GNSS techniques vi. Output GNSS observations in existing local co-ordinate systems including ground based systems vii. Output terrestrial laser scanner observations in existing local co-ordinate systems

Unit 3: Management of Data and Information

Surveyors will be competent in managing all information and data that are relevant to their fields of surveying and will be accountable for the outcomes of work personally carried out or carried out under their direct supervision.

Element	Descriptors
<p>3.1 Process data to accepted standards and for specific requirements</p>	<p>Applicants will need to demonstrate that they are able to :</p> <ul style="list-style-type: none"> i. Verify the integrity of the base data ii. Store data in appropriate data bases. iii. Verify the integrity of the processed data
<p>3.2 Convert data from one system or format to another</p>	<p>Applicants will need to demonstrate that they :</p> <ul style="list-style-type: none"> i. Can list and use the various bases holding spatial and textual data <p>Applicants will need to demonstrate that they are able to :</p> <ul style="list-style-type: none"> ii. Convert and transfer data between systems and format

3.3 Administer electronic and physical data bases	<p>Applicants will need to demonstrate that they are able to :</p> <ul style="list-style-type: none"> i. Apply effective procedures for recording, retrieving and updating information ii. Establish security systems to ensure data protection iii. Implement appropriate maintenance systems
3.4 Analyse, evaluate and interpret data	<p>Applicants will need to demonstrate that they are able to :</p> <ul style="list-style-type: none"> i. Determine the required accuracy and reliability of data ii. Interpret data and ensure its relevance to client needs iii. Enhance or add value to data where applicable iv. Collate and relate data to specific areas of interest
3.5 Process data to create information	<p>Applicants will need to demonstrate that they are able to :</p> <ul style="list-style-type: none"> i. Solve complex problems using appropriate maths processes such as trigonometry and calculus ii. Apply mathematical models to physical processes iii. Apply basic statistics to analyse measurements and examine the variation that occurs in properties iv. Analyse, evaluate and use statistical data

Unit 4: Presentation of Information

Surveyors will be competent in presenting all information that is relevant to their fields of surveying and will be accountable for the outcomes of work personally carried out or carried out under their direct supervision.

Element	Descriptors
4.1 Assemble data into specific data or information sets	<p>Applicants will need to demonstrate that they are able to :</p> <ul style="list-style-type: none"> i. Clarify and determine client needs ii. Identify the potential benefits of creating specific information from various data bases iii. Assemble data into useful information
4.2 Compile and produce maps, plans and charts and photographs	<p>Applicants will need to demonstrate that they are able to :</p> <ul style="list-style-type: none"> i. Use the technology available for graphical and photographic presentation ii. Determine the uses and limitations of data bases iii. Apply appropriate cartographic principles iv. Use a computer aided drafting package v. Identify and use the best methodology to meet client needs
4.3 Provide digital spatial information	<p>Applicants will need to demonstrate that they are able to :</p> <ul style="list-style-type: none"> i. Correctly evaluate the accuracy, reliability and potential uses of data ii. Transfer spatial data files between various formats iii. Integrate spatial data with other information

	iv. Format data to meet customer needs
4.4 Produce models	Applicants will need to demonstrate that they are able to : i. Create digital models of physical surfaces ii. Attach attribute information to a digital model. iii. Transfer model files between various formats
4.5 Formally present information orally to client, government agencies and public forums	Applicants will need to demonstrate that they are able to : i. Identify and use appropriate communication and display techniques to present information in a usable manner ii. Address special interest groups iii. Conduct seminars and public meetings iv. Lead and/or contribute to discussion groups
4.6 Prepare reports	Applicants will need to demonstrate that they are able to : i. Prepare detailed technical reports ii. Prepare information brochures and reports iii. Prepare business reports on surveying matters
4.7 Certify data	Applicants will need to demonstrate that they : i. Understand and can explain the accuracy and reliability of data to be certified ii. Understand and can explain the responsibilities of data certification Applicants will need to demonstrate that they are able to : iii. Apply effective validation procedures iv. Effectively identify and manage risk associated with certification
4.8 Provide advisory services	Applicants will need to demonstrate that they are able to : i. Discuss information with potential users ii. Interpret information and relate it to specific issues iii. Collate information and format it into relevant advice iv. Provide advice on opportunities to add value to existing information v. Provide sound advice to clients on surveying and land management matters

Unit 5: Business Management and Supporting Quality Assurance Programs

Surveyors will be competent to participate in applying business and management skills under the guidance of experienced professional surveyors. They will be responsible for accurately reporting outcomes of all work personally carried out to senior colleagues.

Element	Descriptors
5.1 Plan, organise, direct and control tasks, people and other resources	Applicants will need to demonstrate that they are able to : i. Set work objectives and prioritise activities with guidance ii. Determine work methods and procedures with guidance iii. Estimate times, costs and resources with guidance

	<ul style="list-style-type: none"> iv. Compile work schedules and allocating resources with guidance v. Organise small work teams with guidance
5.2 Adopt sound business practices, including economic planning, financial management and compliance with legal requirements	<p>Applicants will need to demonstrate that they are able to :</p> <ul style="list-style-type: none"> i. Estimate the scope and dimensions of a project or task to facilitate the estimation of job costs with guidance ii. Monitoring running expenses against estimates under supervision iii. Identify legal requirements and explain the need to meet them iv. Assess markets and develop marketing plans with guidance v. Develop and apply risk management programs with guidance vi. Prepare business plans with guidance vii. Improve customer service
5.3 Manage human resources	<p>Applicants will need to demonstrate that they are able to :</p> <ul style="list-style-type: none"> i. Apply an effective staff relations program with guidance ii. Comply with occupational health and safety requirements iii. Comply with equal opportunity, equity and anti-discrimination principles
5.4 Train and develop subordinates in the work place	<p>Applicants will need to demonstrate that they are able to :</p> <ul style="list-style-type: none"> i. Direct training programs under supervision
5.5 Apply project management principles	<p>Applicants will need to demonstrate that they are able to :</p> <ul style="list-style-type: none"> i. Explain the principles of project management ii. Apply project management techniques in work activities iii. Plan, control and monitor projects under supervision.
5.6 Apply self management principles	<p>Applicants will need to demonstrate that they :</p> <ul style="list-style-type: none"> i. Identify and undertake appropriate continuing professional development activities ii. Can explain the need for effective time management <p>Applicants will need to demonstrate that they are able to :</p> <ul style="list-style-type: none"> iii. Apply sound management techniques
5.7 Apply quality assurance principles	<p>Applicants will need to demonstrate that they are able to :</p> <ul style="list-style-type: none"> i. Implement quality assurance programs with guidance ii. Comply with an accepted quality assurance program iii. Perform internal auditing programs with guidance iv. Rectify non-compliance with quality standards v. Suggest improvements to quality assurance processes.
5.8 Implement projects	<p>Applicants will need to demonstrate that they are able to :</p> <ul style="list-style-type: none"> i. Prepare specifications and contracts under supervision ii. Assess tenders and let of contracts under supervision iii. Supervising contracts with guidance iv. Manage and programme development projects under supervision

Unit 6: Communications

Surveyors will be competent in applying communications skills under the guidance of experienced professional surveyors. They will be responsible for accurately reporting significant difficulties to senior colleagues

Element	Descriptors
6.1 Communicate effectively	<p>Applicants will need to demonstrate that they are able to :</p> <ol style="list-style-type: none"> i. Communicate effectively, orally and in writing ii. Compile, interpret and present information under supervision iii. Interpreting briefs and instructions with guidance iv. Issue clear, accurate instructions to subordinates v. Successfully use electronic communications technologies
6.2 Present, promote, report on and advocate ideas on surveying and allied areas of practice	<p>Applicants will need to demonstrate that they are able to :</p> <ol style="list-style-type: none"> i. Prepare and present technical reports under supervision ii. Co-author position and discussion papers on surveying and allied topics for publication iii. Present papers at seminars and public meetings
6.3 Prepare and comprehend surveying documents	<p>Applicants will need to demonstrate that they are able to :</p> <ol style="list-style-type: none"> i. Prepare and interpret surveying reports with guidance ii. Prepare specifications and standards with guidance iii. Prepare submissions and cost estimates with guidance iv. Prepare documents defining work procedures and processes with guidance v. Prepare documents of measurement technology and data acquisition with guidance.
6.4 Comprehend, report on and discuss relevant legal matters	<p>Applicants will need to demonstrate that they are able to :</p> <ol style="list-style-type: none"> i. Operate in accordance with government Acts, Regulations or instructions ii. Contribute to discussions on legal matters pertaining to land and land information with clients, colleagues and other professionals iii. Prepare advice for clients on legal requirements relating to land development under supervision iv. Prepare advice for clients on land rights, land tenure disputes, and rights of entry and occupation under supervision v. Prepare advice for clients on legislation pertaining to planning, development and environment issues under supervision vi. Advise clients on responsibilities and liabilities pertaining to spatial information under supervision.

6.5 Collaborate with colleagues and other interested parties	<p>Applicants will need to demonstrate that they are able to :</p> <ul style="list-style-type: none"> i. Contribute to discussions with other stakeholders on development projects ii. Represent the concerns of clients and/or special interest groups to government, authorities and other stakeholders with guidance iii. Negotiate solutions to common problems with other parties under supervision iv. Preparing advice and information on surveying, Geomatics, and land developments under supervision
6.6 Use professional expertise to contribute to the processes that shape society	<p>Applicants will need to demonstrate that they :</p> <ul style="list-style-type: none"> i. Can explain the need for orderly management and administration of land resources <p>Applicants will need to demonstrate that they are able to :</p> <ul style="list-style-type: none"> ii. Identify opportunities to utilise surveying for the benefit of society

Unit 7: Spatial Reference Systems and Core Data Bases

Surveyors will be competent to contribute to designing, establishing and maintaining spatial reference systems; maintaining core data bases; and determining spatial relationships within land and geographic information systems. They will be accountable for the outcomes of work personally carried out or carried out under their direct supervision.

Element	Descriptors
7.1 Use geodetic reference systems	<p>Applicants will need to demonstrate that they are able to :</p> <ul style="list-style-type: none"> i. Describe the geodetic relationships and elements of geometry of the size and shape of the earth ii. Illustrate the relationships between ellipsoids, geoids, gravity and vertical datums iii. Explain the construction properties and uses of the UTM map projection and identify its fundamental elements
7.2 Establish subsidiary networks	<p>Applicants will need to demonstrate that they are able to :</p> <ul style="list-style-type: none"> i. Carry out or supervise the work required in establishing subsidiary network control datums. ii. Supervise the placement of appropriate reference marks in suitable locations iii. Analyse spatial data pertaining to the subsidiary network iv. Evaluate and adjust created spatial data v. Record network information in appropriate data files vi. Mathematically adjust survey networks by the method of least squares, using both manual methods and computer software packages vii. Analyse and critically evaluate the adjustment

<p>7.3 Integrate spatial reference systems with fundamental physical and cultural data and manage core databases</p>	<p>Applicants will need to demonstrate that they :</p> <ul style="list-style-type: none"> i. Understand and can explain the logical structure of data bases <p>Applicants will need to demonstrate that they are able to :</p> <ul style="list-style-type: none"> ii. Collate, update and maintain core data bases pertinent to topographic data, administrative boundaries, transport corridors, infrastructure and geographic information iii. Create new asset bases and integrate them with core data bases iv. Verify the integrity of data in data bases
<p>7.4 Accredite spatial data standards</p>	<p>Applicants will need to demonstrate that they are able to :</p> <ul style="list-style-type: none"> i. Contribute to the standards required for data created for specific purposes ii. Contribute to developing standard procedures for acquiring and storing spatial data iii. Contribute to developing procedures for testing and validating the integrity of spatial data
<p>7.5 Maintain and manage core data bases</p>	<p>Applicants will need to demonstrate that they are able to :</p> <ul style="list-style-type: none"> i. Review and maintain existing data ii. Interpret data for potential users
<p>7.6 Perform geodetic calculations</p>	<p>Applicants will need to demonstrate that they are able to :</p> <ul style="list-style-type: none"> i. Define the elements of geometry of the ellipsoid and the geoid that are relevant to geodetic surveying ii. Reduce measured angles and distances, manually and with appropriate software, to a form suitable for use in geodetic calculations iii. Perform geodetic calculations of traverses and intersections using geographic coordinates iv. Perform geodetic calculations of traverses and intersections using UTM grid coordinates
<p>7.7 Transform co-ordinates</p>	<p>Applicants will need to demonstrate that they are able to:</p> <ul style="list-style-type: none"> i. Explain the coordinate transformation process ii. Transform three dimensional coordinates between systems and between datums, with the aid of suitable software, to the required level of accuracy
<p>7.8 Make precise observations</p>	<p>Applicants will need to demonstrate that they are able to :</p> <ul style="list-style-type: none"> i. Identify the sources of errors in precise angle observations and the techniques used to minimise their effects ii. Identify the effects of curvature and refraction on levelling and apply this knowledge to trigonometrical levelling

	<ul style="list-style-type: none"> iii. Identify the equipment and methods used in precise levelling and of the sources of error and the techniques to minimise their effects iv. Use statistics to analyse geodetic observations, values and positional results
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Unit 8: Land Administration and Property Development

Surveyors will be competent in carrying out land administration and property development and will participate in advising property developers or managing property development projects.

They will be accountable for the outcomes of work personally undertaken and advice provided, and for work carried out under their direct supervision.

Element	Descriptors
8.1 Advise on land tenure and existing land tenure systems	<p>Applicants will need to:</p> <ul style="list-style-type: none"> i. Demonstrate a sound knowledge and understanding of the principles of land registration and land tenure ii. Debate the advantages and disadvantages of various land titling systems <p>Applicants will need to demonstrate that they are able to :</p> <ul style="list-style-type: none"> iii. Comply with laws in relation to land and land development iv. Explain and operate native title programs with guidance v. Perform financial analysis on establishing and maintaining land administration systems with guidance
8.2 Contribute information and advice to facilitate the administration, control and development of land resources	<p>Applicants will need to demonstrate that they can :</p> <ul style="list-style-type: none"> i. Work within planning law and procedures ii. Explain the functions and roles of other disciplines in property development <p>Applicants will need to demonstrate that they are able to :</p> <ul style="list-style-type: none"> i. Advise on environmental constraints and management policies applicable in various jurisdictions ii. Access available land information resources
8.3 Support sustainable land development	<p>Applicants will need to demonstrate that they are able to :</p> <ul style="list-style-type: none"> i. Apply local knowledge of topography, land tenure, statutory controls and development policies to assist development. ii. Work in a multidisciplinary group iii. Contribute to feasibility studies and impact assessments. iv. Describe the inter-relationships between geology, geomorphology, water, soils, vegetation and fauna resources v. Apply the techniques commonly used to describe and assess the physical land resources vi. Describe the processes involved in undertaking land resource surveys and land evaluation practices

<p>8.4 Provide advice on financial implications of land development</p>	<p>Applicants will need to demonstrate that they are able to :</p> <ul style="list-style-type: none"> i. Apply principles of land valuation with guidance. ii. Evaluate and compare various land use options. iii. Perform cost/benefit analyses for land development projects under supervision. iv. Investigate potential of land for further development. v. Advise clients on opportunities to enhance land value and use. vi. Identify the principles of valuation by using them to obtain a valuation for a range of properties including allotments in a new land development vii. Describe the method and principles used for determining compensation for the compulsory acquisition of land
<p>8.5 Provide design services to optimise land development and encourage sustainable land use</p>	<p>Applicants will need to demonstrate that they are able to :</p> <ul style="list-style-type: none"> i. Plan and design land boundary patterns. ii. Plan and design infrastructure for land divisions and land developments with guidance. iii. Identify options for sustainable land development. iv. Apply basic design parameters and relevant geometric principles to the preliminary design of urban and rural roads v. Explain and apply process of horizontal and vertical road alignment for rural and urban road design vi. Apply basic design parameters to design sewerage services vii. Apply basic design parameters to design of storm water services
<p>8.6 Manage properties and property development</p>	<p>Applicants will need to demonstrate that they are able to :</p> <ul style="list-style-type: none"> i. Apply project management techniques to property development.
<p>8.7 Undertake cadastral surveys</p>	<p>Applicants will need to demonstrate that they :</p> <ul style="list-style-type: none"> i. Can explain the law and principles regarding the reinstatement of cadastral boundaries <p>Applicants will need to demonstrate that they are able to under supervision:</p> <ul style="list-style-type: none"> ii. Assess all relevant evidence and draw appropriate conclusions about the location of boundaries. iii. Understand and apply relevant legislation and standards for the conduct of cadastral surveys and the preparation of plans. iv. Ensure that plans are fit for purpose and if necessary capable of achieving the desired actions regarding the creation of land titles and the integrity of the land boundary system.

8.8 Prepare and manage planning applications	<p>Applicants will need to demonstrate that they are able to :</p> <ul style="list-style-type: none"> i. Describe the planning processes that are used in Queensland at State, regional and local government levels to control land use and development ii. Discuss the purpose of, and the significant elements of, the Queensland's current planning legislation iii. Outline the principles of performance based design iv. Make conforming applications to Local Authorities under supervision
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Unit 9: Controlling the Location of Developments

Surveyors will be competent in the surveying required to control the location and quality of engineering developments including the measurement of earthworks; the installation of machines, structures or equipment at industrial sites; or the extraction of materials at mining sites. They will be accountable for the outcomes of work personally carried out or carried out under their supervision and control.

Element	Descriptors
9.1 Control and locate engineering works, development projects, and the building or installation of structures and machines.	<p>Applicants will need to demonstrate that they :</p> <ul style="list-style-type: none"> i. Understand the roles of other professionals, technicians and trades persons <p>Applicants will need to demonstrate that they are able to :</p> <ul style="list-style-type: none"> ii. Read, interpret and understand detailed design and construction plans. iii. Establish appropriate reference systems. iv. Select and use the appropriate technology for site operations. v. Set out works. vi. Communicate results to client, construction staff and other consultants. vii. Use adequate redundant measurements to validate data.
9.2 Control and measure the extraction of minerals and other materials.	<p>Applicants will need to demonstrate that they :</p> <ul style="list-style-type: none"> i. Can explain a variety of mining and extraction processes ii. Can explain the measuring and monitoring outcomes needed for the safe, cost effective extraction of materials. iii. Can explain the roles of other professionals, technicians, and trades persons. <p>Applicants will need to demonstrate that they are able to :</p> <ul style="list-style-type: none"> iv. Establish appropriate reference systems. v. Select and use the appropriate technology for site operations. vi. Establish effective reporting systems.

<p>9.3 Establish quality control systems</p>	<p>Applicants will need to demonstrate that they are able to :</p> <ul style="list-style-type: none"> i. Determine client needs and required accuracies. ii. Apply appropriate technology. iii. Detail methods and procedures. iv. Implement measuring and monitoring programs. v. Implement effective reporting procedures.
<p>9.4 Monitor the position, shape and size of structures, land forms and sea beds</p>	<p>Applicants will need to demonstrate that they :</p> <ul style="list-style-type: none"> i. Understand the roles of other professionals, technicians and trades persons ii. Can explain the basic principles, theory and accuracy of various aerial and terrestrial photogrammetric, and remote sensing methods <p>Applicants will need to demonstrate that they are able to :</p> <ul style="list-style-type: none"> iii. Read and understand design and detail plans, and apply the required accuracies. iv. Establish appropriate reference systems. v. Apply appropriate technology. vi. Implement effective reporting systems. vii. Establish procedures to validate results. viii. Judge the applicability of photogrammetric and remote sensing methods to mapping and engineering projects

Unit 10: Research, Development and Commercialisation

Surveyors will be competent in undertaking research in various fields of surveying and participating in the development and establishment of new services and products that are relevant to the surveying profession. They will be accountable for any research and development work personally undertaken or carried out under their direct supervision.

Element	Descriptors
<p>10.1 Perform research</p>	<p>Applicants will need to demonstrate that they are able to :</p> <ul style="list-style-type: none"> i. Identifying potential research areas. ii. Undertake literature and information searches. iii. Undertake fundamental or applied research. iv. Identify and communicate research outcomes.
<p>10.2 Formulate methods and ideas for development</p>	<p>Applicants will need to demonstrate that they are able to :</p> <ul style="list-style-type: none"> i. Identify development opportunities. ii. Conceptualise thoughts and ideas. iii. Assess and appraise methods and ideas. iv. Nominate methods and ideas worthy of further development.

10.3 Identify and seek resources to further research and development	<p>Applicants will need to demonstrate that they are able to :</p> <ul style="list-style-type: none"> i. Undertake cost/benefit analysis and estimates of resource requirements for development programs. ii. Identify potential resource suppliers. iii. Prepare proposals and submissions setting out development plans and seeking resources.
10.4 Carry out market research	<p>Applicants will need to demonstrate that they are able to :</p> <ul style="list-style-type: none"> i. Contribute to determining desirable product properties. ii. Contribute to determining desirable product demand. iii. Contribute to developing prototypes and pilot schemes. iv. Contribute to identifying likely barriers to new products or services.
10.5 Commercialise research outcomes	<p>Applicants will need to demonstrate that they are able to :</p> <ul style="list-style-type: none"> i. Contribute to economic evaluation of research outcomes. ii. Contribute to developing promotion and marketing strategies for new products or services. iii. Contribute to presentation of final products.

Unit 11: Education and Training

Demonstrated by experienced professional surveyors working in the tertiary sector or providing assistance to professional educators and trainers on surveying matters. Surveyors may be providing training for subordinates or assisting with continuing professional development programs. They will contribute to education and training at a level commensurate with their competence in a recognised field of surveying and their general knowledge of the surveying industry.

Element	Descriptors
11.1 Contribute to the development of surveying education	<p>Applicants will need to demonstrate that they are able to :</p> <ul style="list-style-type: none"> i. Determining the education needs of surveying personnel with guidance. ii. Determine education plans and programs for tertiary education with guidance. iii. Contribute to developing curriculum, syllabi or exercises in surveying.
11.2 Assist in conducting surveying education	<p>Applicants will need to demonstrate that they are able to :</p> <ul style="list-style-type: none"> i. Develop courses and teaching material for education with guidance. ii. Contribute to effective teaching, development and learning activities. iii. Use appropriate technology to assist in supporting education.

11.3 Develop and conduct training programs	Applicants will need to demonstrate that they are able to : <ul style="list-style-type: none">i. Develop training material for training programs with guidance.ii. Develop practical experience programs with guidance.iii. Develop suitable training programs for surveying graduates seeking registration with guidance.iv. Implement suitable training programs under supervision.v. Supervise the training of surveying graduates.
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