



Pathway guide

Geomatics

August 2018



# Pathway guide

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# Geomatics

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## Introduction

This guide supports the Geomatics pathway. It is designed to help you understand more about qualifying in this area.

You must use this guide in conjunction with the core assessment documentation which is available on the RICS website and comprises of:

- Requirements and competencies guide
- Candidate guide for your RICS assessment e.g. APC, Academic, Senior Professional, Specialist
- Counsellor guide.

You can download all the supporting guidance from [rics.org/apcguides](https://www.rics.org/apcguides)

All RICS pathways are global, though it is appreciated that markets may vary from country to country. If you have any queries please contact your local office.

## About the competencies

The RICS competency framework ensures those applying for the RICS qualification are competent to practise and meet the highest standards of professionalism required by RICS. There is a wide range of pathways available to qualify as an RICS professional covering many different areas of practice.

The RICS assessment aims to assess that you are competent to carry out the work of a qualified chartered surveyor. To be competent is to have the skill or ability to perform a task or function. The RICS competencies are also based upon attitudes and behaviours. The competencies are presented in a generic way so they can be applied to different areas of practice and geographical locations. It is important that you interpret them within the context of your own area of practice or specialism and location.

Each competency is defined at three levels of attainment. You must reach the required level in a logical progression and in successive stages.

**Level 1** – knowledge and understanding

**Level 2** – application of knowledge

**Level 3** – reasoned advice, depth and synthesis of technical knowledge and its implementation.

The competencies are in three distinct categories:

**Mandatory** – the personal, interpersonal, professional practice and business skills common to all pathways and mandatory for all candidates.

**Technical core** – the primary skills of your chosen pathway.

**Technical optional** – Selected as additional skill requirements for your pathway from a list of competencies relevant to the area of practice.

The mandatory competency requirements are set out in detail in the Requirements and competencies guide.

## Choosing your competencies

It is important that you give careful thought to your choice and combination of competencies. Your choice will inevitably reflect the work you do in your day-to-day environment (driven by the needs of your clients/employer). Your choice and combination of competencies will be a reflection of your judgement.

At the final assessment interview, the assessors will take these choices into account. They will expect you to present a sensible and realistic choice that reflects the skills needed to fulfil the role of a surveyor in your field of practice.

This guide should help candidates and employers with a degree of assistance in choosing the competencies that are most appropriate to their area of practice.

## Where to find help

RICS has fully trained teams across the globe who will be able to help you with any queries. For details of your local office – [rics.org/contactus](https://www.rics.org/contactus)

## About the pathway

Geomatics is the science and study of spatially related information focusing on the collection, interpretation/analysis and presentation of the natural, built, social and economic environments. As the underpinning information provider of the land and property life cycle, geomatics is of fundamental importance to society.

Driven by technology and maintaining its role in land law and other socioeconomic areas, leading chartered surveying firms realise the importance of geomatics, not only to the profession but to the future success of their businesses. Particularly in the day-to-day integration of geomatics with traditional forms of real estate management, land administration and construction.

There is huge demand and there are major opportunities for chartered land, hydrographic and engineering surveyors. This is due to a high media profile, coupled with the changing nature of mapping and spatial data management worldwide. This includes rapid advancements in Information Technology e.g. GIS, Global Navigation Satellite Systems, 'joined up government' initiatives, digital cadastres and many more. The growth in EU and national governments' spatial data agendas and legislation needs chartered surveyors to fill senior management and advisor roles, offering highly specialist expertise and knowledge.

### RICS qualification

This pathway would also suit anyone with a good aptitude for science, technology, geography, internationalism, mathematics and much more.

The professional group counts the following areas, all of which a chartered land/hydrographic/engineering surveyor could potentially work within:

- Land and hydrographic surveying
- Mapping and positioning
- Global and local navigation systems
- Geographic information science
- Engineering survey
- Cadastre and land registration
- Private, regional and international boundaries determination
- Dispute resolution and expert witness
- Land law, administration and reform
- Cartography
- Photogrammetry and remote sensing
- Spatial and metadata management, interpretation and manipulation
- Land, coastal and marine information management
- Ocean bed and resource surveys
- Monitoring of structures
- Project management
- Research and consultancy

### Chartered alternative designations

Candidates who successfully complete this pathway may select from the following chartered alternative designations:

- 'Chartered Land Surveyor'
- 'Chartered Hydrographic Surveyor' (candidates pursuing this must take the hydrographic core competency to level 3)
- 'Chartered Engineering Surveyor' (candidates pursuing this must take the engineering surveying core competency to level 3)

RICS also offers Hydrographic Surveying and Geospatial Surveying pathways as part of the Associate Assessment. For further details please go to [rics.org/associate](https://www.rics.org/associate)

# Pathway requirements

Mandatory	Core	Optional
<p><b>Level 3</b></p> <ul style="list-style-type: none"> <li>Ethics, Rules of Conduct and professionalism</li> </ul> <p><b>Level 2</b></p> <ul style="list-style-type: none"> <li>Client care</li> <li>Communication and negotiation</li> <li>Health and safety</li> </ul> <p><b>Level 1</b></p> <ul style="list-style-type: none"> <li>Accounting principles and procedures</li> <li>Business planning</li> <li>Conflict avoidance, management and dispute resolution procedures</li> <li>Data management</li> <li>Diversity, inclusion and teamworking</li> <li>Inclusive environments</li> <li>Sustainability</li> </ul>	<p><b>Three to Level 3</b></p> <ul style="list-style-type: none"> <li>Cadastre and land administration</li> <li>Conflict avoidance, management and dispute resolution procedures</li> <li>Engineering surveying</li> <li>Geodesy</li> <li>GIS</li> <li>Hydrographic surveying</li> <li>Legal/regulatory compliance</li> <li>Measurement</li> <li>Remote sensing and photogrammetry</li> <li>Surveying and mapping</li> <li>Surveying of land and sea</li> <li>Use of the marine environment</li> </ul> <p><b>Level 1</b></p> <ul style="list-style-type: none"> <li>Measurement</li> </ul>	<p><b>One to Level 3 and two to Level 2</b>, including any not already chosen from the core list</p> <ul style="list-style-type: none"> <li>Big data</li> <li>BIM management</li> <li>Construction technology and environmental services</li> <li>Consultancy services</li> <li>Data management</li> <li>Development/project briefs</li> <li>Environmental assessment</li> <li>Ground engineering and subsidence</li> <li>Management of the natural environment and landscape</li> <li>Planning and development management</li> </ul> <p>Plus, <b>one to Level 2</b> from the full list of technical competencies, including any not already chosen from the core or optional lists.</p> <div data-bbox="1668 587 2107 879" style="background-color: #e0f2f1; padding: 10px;"> <p>To achieve the <b>Chartered Engineering Surveyor</b> designation candidates must select <b>Engineering surveying to Level 3</b></p> <p>To achieve the <b>Chartered Hydrographic Surveyor</b> designation candidates must select <b>Hydrographic surveying to Level 3</b></p> <p>To achieve the <b>Chartered Land Surveyor</b> designation candidates must select <b>Surveying and mapping to Level 3.</b></p> </div>

# Technical competencies guidance

## Big data

This competency involves the identification of complex problems as applied to the built and natural environment and the leveraging of data value.

Candidates will be part of multidisciplinary project teams, including planners, city engineers, surveyors, data architects, data engineers, and analysts, working with big data. The work is likely to include liaison with policy and operations teams to understand how big data can be leveraged and combined to add value.

It requires a knowledge of the technical challenges posed by big data, and the specialised IT architectures and techniques employed for the storage, retrieval and manipulation of big data structures.

### Examples of likely knowledge, skills and experience at each level

#### Level 1

Demonstrate knowledge and understanding of the principles of big data processing, the range of available sources of big data, data dynamics and a critical appreciation of the latest big data research issues.

Examples of knowledge comprised within this level are:

- The different phases of software lifecycle
- The value of analysis and which data sources, analytical techniques and tools can be used
- How algorithms are designed, optimised and applied at scale
- What data is important to ensure business performance
- The importance of presentation and applicability of any data that is captured through dashboards or client portals
- Have an appreciation of the possible benefits of Machine learning and Artificial Intelligence and how this can be supported through data
- The various Computer Aided packages that are available in the marketplace
- The principles of a technical security architecture and how these can be used to reduce information risk
- The principles of Information Security Governance and the purpose of Information Security strategies

#### Level 2

Demonstrate an understanding of the techniques and the tools required for the maintenance of data quality, data hygiene and the statistical modelling, analysis and visual data interrogation of big data sets.

Examples of activities and knowledge comprised within this level are:

- Ability to source, access, manipulate and engineer data processes with data that typically have characteristics of volume, velocity and variety
- Can select and use appropriate statistical methods for sampling, distribution assessment, bias and error
- Different data engineering tools for repeatable data processing and can compare between different data models
- Build credible statistical models from the data and use best coding practices to generate reproducible work
- Problem structuring methods and evaluating when each method is appropriate
- Draw on relevant technical and analytical standards from across government and industry
- Expose data from systems (for example, through APIs), link data from multiple systems and deliver streaming services

#### Level 3

Provide evidence of design and implementation of big data analysis using algorithms to handle data sets in a scientific computing environment for the analysis of big data.

Examples of activities and knowledge comprised within this level are:

- Be able to explore and visualise the data to present the 'story' of the data in a meaningful way to a range of technical and non-technical audiences
- Advise on how big data can be used to support strategic and operational decision making to create impact and add value from its use
- Advise on the selection, design, justification, implementation and operation of controls and management strategies to maintain the security, confidentiality, integrity, availability, accountability and relevant compliance of information systems with legislation, regulation and relevant standards
- Driving business change through the application of big data analytics
- Advise on the future of big data.

continued on next page



## Big data (continued)

### Level 1

- Legislative and regulatory instruments relevant to Information Security relevant to own area of practice and location
- Beyond RICS' ethical standards, candidates should understand and adhere to the applicable data science ethics framework.

### Level 2

- Works with other technologists and analysts to integrate and separate data feeds to map, produce, transform and test scalable data products that meet client needs
- Applies scientific methods through experimental design, exploratory data analysis and hypothesis testing to reach robust conclusions
- The ability to data mine and discover trends or sequences that can inform and direct business direction.

### Level 3

## Building information modelling (BIM) management

This competency encompasses the establishment and management of the information modelling systems on projects. It covers collaborative process and technological principles involved in implementing Building Information Modelling (BIM).

### Examples of likely knowledge, skills and experience at each level

Level 1	Level 2	Level 3
<p>Demonstrate knowledge and understanding of the technical, process and collaborative aspects of the use of BIM on projects.</p>	<p>Develop and apply management systems to facilitate the use of BIM on projects, including unified control and reporting procedures.</p>	<p>Provide evidence of how the knowledge and experience gained in this competency has been applied to advising clients and/or senior management on BIM strategy.</p>
<p>Examples of knowledge comprised within this level are:</p> <ul style="list-style-type: none"> <li>• BIM strategies and implementation</li> <li>• The various technical options and solutions for using information modelling</li> <li>• The collaborative processes necessary for BIM adoption</li> <li>• Standard classification systems and their use in infrastructure</li> <li>• Relevant internationally recognised management standards such as Construction Operations Building Information Exchange (COBie).</li> </ul>	<p>Examples of activities and knowledge comprised within this level are:</p> <ul style="list-style-type: none"> <li>• Preparation of a BIM execution plan</li> <li>• Designing and implementing a BIM management process</li> <li>• Analysis of comparative BIM solutions</li> <li>• Maintaining an information model</li> <li>• Agreeing and implementing contractual aspects of BIM such as separate protocol</li> <li>• Facilitating and managing project team members for BIM implementation.</li> </ul>	<p>Examples of activities and knowledge comprised within this level are:</p> <ul style="list-style-type: none"> <li>• Analysing, assessing, evaluating and reporting on options for BIM strategies at a corporate or project level</li> <li>• Designing and advising on collaborative strategies for the successful implementation of BIM on projects</li> <li>• Advising on the contractual and commercial implications of using BIM on projects</li> <li>• Advising on options for software and protocols on BIM projects</li> <li>• Advising on technical information systems requirements for BIM at corporate or project level.</li> </ul>

## Cadastre and land administration

This competency deals with assessing documents relating to the demarcation, registration and transfer of land in order to define, on the ground, the extent of legal and/or registered title. It involves the preparation of expert lucid reports for the legal profession and provision of opinions to the legal profession and property owners.

### Examples of likely knowledge, skills and experience at each level

#### Level 1

Demonstrate knowledge and understanding of field and office procedures for boundary and/or cadastral surveys appropriate to your national and/or international location. Understand legal and physical boundaries and provide examples of these. Understand the principles of land management.

Examples of knowledge comprised within this level are:

- Global economic and market conditions
- The changing nature of business
- Core business drivers
- Clear view of what is meant by a business's vision and mission
- Organisational structures, values and objectives
- Business performance
- Strategic use of real estate
- Decentralised vs centralised
- Organisational objectives.

#### Level 2

Apply your knowledge of the principles of land registration, land management, administration and legislation related to rights in real estate internationally and nationally. Understand the relationship between the surveyor, client and legal profession and preparation of evidence for the legal process.

Examples of activities and knowledge comprised within this level are:

- Adopting appropriate scales for measured surveys to be used in cadastre
- Choosing which documentation to rely upon
- Practising with complete independence from the client
- Requesting documents from the legal profession
- Obtaining documents from the Land Registries
- Using and interpreting of aerial photography and digital imagery
- Reporting relevant matters back to the legal profession
- Understanding of the requirements for determining boundaries.

#### Level 3

Provide evidence of reasoned advice, and fully understand the role and responsibility of an expert witness, on the resolution of disputes by litigation and alternative procedures.

Examples of activities and knowledge comprised within this level are:

- Advising on the duty of an expert to the court
- Preparing expert reports for use in litigation
- Advising on the requirements of an expert witness within the civil procedure rules
- Advising on the requirements and role of an expert at a 'meeting of experts'
- Advising on the role of an expert at a 'conference with counsel'
- Preparing for trial
- Advising on the role of an expert during and after the trial
- An appreciation of alternative dispute resolution options, particularly the differences and advantages/disadvantages when comparing mediation with arbitration.

## Conflict avoidance, management and dispute resolution procedures

This covers the recognition, avoidance, management and resolution of disputes, involving an awareness of different dispute resolution processes and an understanding of the application of dispute resolution procedures appropriate to the area and jurisdiction of professional practice.

### Examples of likely knowledge, skills and experience at each level

Level 1	Level 2	Level 3
<p>Demonstrate knowledge and understanding of the techniques for conflict avoidance, conflict management and dispute resolution procedures including for example adjudication and arbitration, appropriate to your pathway.</p>	<p>Provide evidence of practical application in your area of practice having regard to the relevant law.</p>	<p>Provide evidence of the application of the above in the context of advising clients in the various circumstances referred to above.</p>
<p>Examples of knowledge comprised within this level are:</p> <p>A basic knowledge and understanding of some of the following, as most appropriate to your market sector/areas of specialism:</p> <ul style="list-style-type: none"> <li>• Common causes of disputes</li> <li>• The contribution of some of the following to dispute avoidance:                             <ul style="list-style-type: none"> <li>– Risk management [its basic principles and techniques]</li> <li>– Early warning systems</li> <li>– Partnering techniques</li> <li>– Clear and robust client briefings</li> </ul> </li> <li>• Theories of negotiation and the role of effective communication and negotiation</li> <li>• The primary features, advantages and disadvantages of a range of dispute resolution procedures and their surrounding statutory and/or non-statutory legal/ judicial context [e.g. how forms of contract deal with dispute resolution, and the scope of such clauses]:                             <ul style="list-style-type: none"> <li>– Mediation [could include contracted and project mediation] and conciliation</li> <li>– Dispute Resolution Boards [DRBs]</li> <li>– Dispute Resolution Advisers [DRAs]</li> <li>– Adjudication</li> </ul> </li> </ul>	<p>Examples of activities and knowledge comprised within this level are:</p> <ul style="list-style-type: none"> <li>• Adopting – or encouraging the adoption of [as appropriate] – suitable dispute avoidance techniques</li> <li>• Negotiating actively on behalf of clients [e.g. performance failure, unavailability, contract variations, contract interpretations and payment] prior to third-party referral</li> <li>• Assisting in the collation or preparation of claims/counter-claims and submissions</li> <li>• Assisting in the identification, gathering and collation of facts and expert evidence for use in expert reports</li> <li>• Sufficient understanding of the main points of the statutory or non-statutory law relevant to/underpinning any particular dispute resolution process and its application.</li> </ul>	<p>Examples of activities and knowledge comprised within this level are:</p> <ul style="list-style-type: none"> <li>• Advising clients of the most suitable means of dispute avoidance on their projects, and of dispute resolution procedures appropriate to their individual circumstances, demonstrating appreciation of when to seek further specialist advice and when to advise clients within the scope of the insurance cover of the candidate’s organisation</li> <li>• Involvement in, or assistance with, a referral to a third-party resolution process and associated management of that process on behalf of clients.</li> </ul> <p>NB: Please note that the roles of acting as a third-party dispute resolver – or expert witness, are – for the vast majority of candidates – not likely to be an activity that is undertaken. It is only a small minority of candidates with substantive work experience for whom this is likely to be relevant.</p>

## Conflict avoidance, management and dispute resolution procedures (cont.)

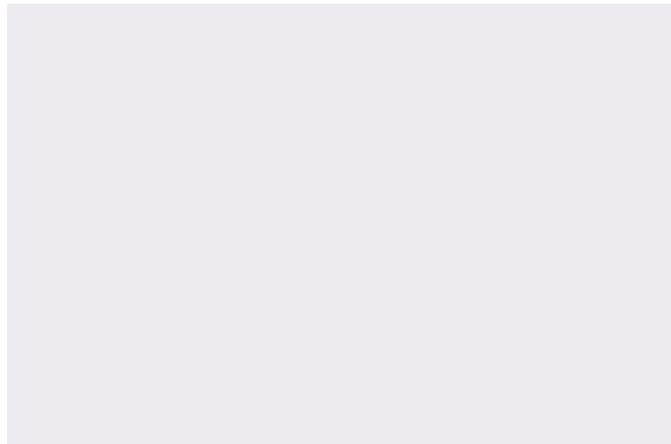
### Level 1

- Independent expert determination
- Arbitration
- Litigation
- The possible roles of a surveyor as an expert witness and/or an advocate, to include an awareness of the existence and scope of applicability of RICS guidance for expert witnesses and advocates
- The range of nominating bodies and services available to resolve disputes, and particularly the role of the RICS Dispute Resolution Service and any specialised dispute resolution schemes it offers relevant to your market sector
- The RICS Global Professional Statement on Conflict of Interest and any appropriate national RICS guidance.

### Level 2



### Level 3



## Construction technology and environmental services

This competency covers the design, engineering surveying and construction of buildings and other structures. Candidates should have a clear understanding of the design and construction processes commonly used in the industry. They should have detailed knowledge of construction solutions relevant to their projects. This competency is particularly useful for those practicing chartered engineering surveying pathway.

### Examples of likely knowledge, skills and experience at each level

#### Level 1

Demonstrate knowledge and understanding of the principles of design and construction relating to your chosen field of practice.

Examples of knowledge comprised within this level are:

- The stages of design from inception to completion
- Impact of current legislation and regulations (both national and international) in particular, health and safety regulations
- How the various elements of the building work inter-relate
- The process of constructing the works
- Ability to adapt engineering surveying methods and instrumentation to particular construction processes/methods
- Calibration and instrumentation/survey method limitations.

#### Level 2

Apply your knowledge to the design and construction processes.

Examples of activities and knowledge comprised within this level are:

- Understanding alternative construction details in relation to functional elements of the design such as different types of piling or structural frame solutions
- Implement appropriate engineering surveying methods to project
- Produce as built drawings/surveys to appropriate and agreed formats, scales, accuracies and output
- Advise on monitoring, engineering surveying and survey techniques/methods.

#### Level 3

Advise on the selection and application of particular processes within your area of experience. This should include liaison with specialists and consultants to develop project specific design and construction solutions.

Examples of activities and knowledge comprised within this level are:

- Advising on the choice of construction solutions for your project
- Reporting on the impact of different design solutions and construction processes on cost and programme.

## Consultancy services

This competency is about the provision of consultancy services to a range of different clients across the whole life cycle of the built environment.

### Examples of likely knowledge, skills and experience at each level

#### Level 1

Demonstrate knowledge and understanding of the procurement and execution of advisory and strategic consultancy services in the context of the real estate and construction sectors.

Examples of knowledge comprised within this level are:

- Different forms of procurement for consultancy services
- The range of different consultancy interventions and approaches
- The consultancy cycle
- The types of problems, risks and issues that may arise during each phase of the consultancy cycle
- The importance of agreeing a clear contract with clients
- The need for the planning, timing and managing of consultancy interventions
- Managing the use of resources
- Managing client expectations
- Forms of reporting
- How to manage ethical dilemmas
- The principal tools and techniques relevant to consultancy services
- Importance of confidentiality when dealing with sensitive information.

#### Level 2

Apply your knowledge of the provision of consultancy services in the context of the real estate and construction sectors.

Examples of activities and knowledge comprised within this level are:

- Preparing consultancy service plans
- Preparing client briefs
- Updating reports to clients
- Negotiating client contracts
- Dealing with ethical dilemmas
- Selecting appropriate tools and techniques for a given consultancy service
- Using selected tools and techniques to achieve agreed outcomes
- Keeping appropriate records.

#### Level 3

Give reasoned advice, prepare and present consultancy reports, together with relevant analysis to clients, in the context of the real estate and construction sectors.

Examples of activities and knowledge comprised within this level are:

- Providing reports containing strategic advice and recommendations to a range of clients
- Presenting to clients
- Implementing consultancy intervention.

## Data management

This competency covers how data relating to individual projects and a surveyor’s work generally is collected, stored and retrieved. In addition to having knowledge of the different storage systems and data sources available and how they work, a candidate should also understand the principles behind the systems and what makes them effective. Candidates should also have knowledge of how general information and data is managed on a project and the increasing use of computerised central project databases.

### Examples of likely knowledge, skills and experience at each level

#### Level 1

Demonstrate knowledge and understanding of the sources of information and data, and the systems applicable to your area of practice, including the methodologies and techniques most appropriate to collect, collate and store data.

Examples of knowledge comprised within this level are:

- The use of published sources of data
- How data is collected, analysed and stored within your employer’s organisation
- How project information is stored within your employer’s organisation
- How electronic database systems work
- The use of computerised central project databases or Building Information Modelling, the benefits, challenges and dangers
- How technical libraries are set up and used
- Legislation applicable to data management and data access.

#### Level 2

Provide evidence of practical application in your area of practice and understand the relevance of information gathered and the uses to which it can be applied. Analyse the information and data collected.

Examples of activities and knowledge comprised within this level are:

- Obtaining data from published sources for use on a project
- Obtaining data from in-house sources
- Extracting data for inclusion in a database
- Setting up and using paper based or electronic project filing systems
- Using a computerised central project database
- Inputting and extracting data from BIM
- Retrieving information from a technical library
- Setting up a technical library.

#### Level 3

Provide evidence of reasoned advice given to clients and others on the use and practical application of the information collected and systems used, and/or specify the most appropriate way for your own and/or client organisation to collect, analyse and apply relevant information and data.

Examples of activities and knowledge comprised within this level are:

- Advising on data storage system
- Advising on business filing systems
- Benchmarking from analysed historic data
- Advising on the use of a computerised central project database
- Complying with client’s data security requirements.



## Development/project briefs

The purpose of development briefs is to stimulate interest in development sites whilst project briefs influence the form that a desired development will take. Both provide a framework for developers in the conception of major types of development schemes. Geomatics professionals can play a major role in the spatial and procedural aspects of development/projects briefs.

### Examples of likely knowledge, skills and experience at each level

#### Level 1

Demonstrate knowledge and understanding of the information required to prepare a development brief or project brief.

Examples of knowledge comprised within this level are:

- The objectives of development/project briefs
- Essential site details including history, location, accessibility, services and utilities
- Environmental features and issues
- The consultation process
- The planning policy background
- Market conditions
- Relevant RICS guidance
- Review land ownership documentation and boundary definition
- Assess spatial data capture and output needs
- Assess data needs [i.e. aerial survey, national mapping, planning portal, historical mapping etc.].

#### Level 2

Apply your knowledge to identify, select, assemble and analyse information relevant to the preparation of development briefs or outline project briefs.

Examples of activities and knowledge comprised within this level are:

- Producing a development/project brief understanding geospatial elements
- Analysing gathered information and data for a development/project brief
- Producing agreed specification and decide on survey needs
- Reviewing and highlighting any legal constraints [i.e. easements, neighbour issues]
- Advising on boundary issues including determined boundaries and as-built surveys.

#### Level 3

Apply information in the preparation and presentation of development briefs or detailed design briefs, or parts thereof.

Examples of activities and knowledge comprised within this level are:

- Using a development/project brief to design a development scheme
- Negotiating agreements with stakeholder interests
- Planning the implementation of a development scheme
- Formulating financial arrangements for a development scheme.

## Engineering surveying

Engineering surveying is the art of determining, and/or setting-out the position of features on, above, or below the earth's surface to facilitate the design and construction of engineering projects, and buildings.

### Examples of likely knowledge, skills and experience at each level

#### Level 1

Demonstrate knowledge and understanding of the principles of construction setting out, deformation and as-built surveys. Be fully conversant with all forms of construction drawings, plans and surveys.

Examples of knowledge comprised within this level are:

- Types of ground markers, installation techniques and suitability for use
- Requirements for survey data capture and presentation for design purposes in your field of operation
- Setting-out techniques
- The importance of comparison of designed and as-built spatial locations
- Be conversant with construction drawings, plans and surveys
- Site health and safety issues
- Basic principles of civil engineering, terminology and construction techniques.

#### Level 2

Apply your knowledge on site of safety, site management procedures and civil engineering/ structural principles.

Examples of activities and knowledge comprised within this level are:

- Recognising options, choosing and justifying instrument suitability for use in engineering projects
- Understanding accuracies and errors and how they apply
- Checking the work of others
- Leading the work of teams and individuals
- Identifying hazards and undertaking risk assessments
- Producing method statements for site survey activities
- Communicating and presenting results of surveys to others.

#### Level 3

Plan, specify and give reasoned advice on engineering surveys; define and assess accuracies and tolerances; manage the engineering surveying element in large projects; and understand the principles of good engineering practice

Examples of activities and knowledge comprised within this level are:

- Designing and supervising provision, observation, computation and checking of plan and height control
- Advising other construction/design professionals on all aspects of site measurement; contributing to project management team decision-making
- Producing project resource plans and budgets for programmes of work
- Defining survey processes and assessing accuracy and tolerances of survey systems
- Managing the engineering survey element within a large project
- Understanding and analysing the impact of your decisions on all aspects of the project
- Implementing project health and safety strategy for site surveying elements of a project.

## Environmental assessment

This competency is about an understanding and application of the principles of environmental assessment, particularly Environmental Impact Assessment and Strategic Environmental Impact Assessment for projects, within the planning and regulatory framework.

### Examples of likely knowledge, skills and experience at each level

#### Level 1

Demonstrate knowledge and understanding of appropriate environmental assessment concepts, processes and systems. This should include responsibilities imposed by law, codes of practice and other regulations relating to environmental assessment.

Examples of knowledge comprised within this level are:

- Principles of Environmental Impact Assessment (EIA) and Strategic Environmental Impact Assessment (SIA) regulations arising from EC Directives and national/local legislation
- Data gathering processes needed for EIAs
- Where EA may apply and whether this involves formal or informal environmental assessment
- The basic processes, procedures and requirements of formal EIA and SIA.

#### Level 2

Apply in practice your understanding of environmental assessment and the requirements for compliance, including undertaking an environmental assessment.

Examples of activities and knowledge comprised within this level are:

- Advising on the need for environmental assessment, including EIA and SIA for development projects
- Advising on requirements and scope of EIA and the regulators' roles
- Integrating EIA with topographic mapping and other data sources to form a complete client brief.

#### Level 3

Provide evidence of reasoned advice including the preparation and production of reports based on appropriate environmental assessments.

Examples of activities and knowledge comprised within this level are:

- Advising on the need and application of EIA, SIA and EA
- Co-ordinating and providing specialist advice on these, including negotiations with clients and regulators
- Preparing and compiling environmental statements and non-technical summaries for submission to clients and regulators, and other stakeholders.

## Geodesy

Geodesy is primarily concerned with positioning and the gravity field and geometrical aspects of their temporal variations, although it can also include the study of the earth’s magnetic field. Geodesy can be divided in geomensuration, which is concerned with measuring the earth on a global scale, and surveying, which is concerned with measuring parts of the surface. Geodesy is a primary skill set of all chartered land and hydrographic surveyors.

### Examples of likely knowledge, skills and experience at each level

#### Level 1

Demonstrate knowledge and understanding of the principles of geodesy, Global Navigation Satellite Systems, global/regional/national geodetic reference systems, geoids, datums and projections.

Examples of knowledge comprised within this level are:

- The difference between geoid and ellipsoid
- The differences between types of projections, with their advantages and disadvantages
- The applications and limitations of Global Navigation Satellite System (GNSS), with emphasis on GPS
- The definition of a datum, and the existence of datums relevant to the location of the candidate.

#### Level 2

Apply your knowledge in practice, specify and plan surveys and instrumentation needs, including the error sources and ‘fitness for purpose’ of data. Use industry standard software and apply network adjustments and/or transformations.

Examples of activities and knowledge comprised within this level are:

- Understanding the various modes of GNSS (GPS) positioning [static, rapid static, kinematic, real-time kinematic]
- Understanding the levels of accuracy achievable, equipment, data collection and processing strategies required for a variety of surveying/engineering tasks including: topographic survey, setting out, control establishment
- Planning and executing relevant GNSS (GPS) surveys to appropriate levels of accuracy, including data processing
- Using standard commercial GNSS (GPS) processing packages and appropriate transformation routines to transform GPS based coordinates to national datums.

#### Level 3

Provide evidence of reasoned advice on advanced practice and planning. Use advanced software and carry out adjustments and analysis. Advise on client specifications and final product needs.

Examples of activities and knowledge comprised within this level are:

- Understanding differences between various orbit products, where to obtain and when to apply
- Being able to select and apply appropriate models/estimation strategies within commercial GNSS (GPS) processing software e.g. tropospheric estimation
- Being able to advise clients on detailed design, observation and processing requirements for high precision or large scale projects
- Producing and commenting final processing reports and comment from a strong knowledge base on levels of achieved accuracies
- Supervising and training junior colleagues in the field use of GPS equipment and data processing techniques.

## GIS [Geographical Information Systems]

A GIS uses computer technology to integrate, manipulate and display a wide range of information to create a picture of an area's geography, environment and socioeconomic characteristics. Beginning with a computerised topographic map as its base, a GIS overlays and integrates graphic and textual information from separate databases. The end result is a tool that can support decision-making and problem solving and provide almost instantaneous answers to complex questions.

### Examples of likely knowledge, skills and experience at each level

#### Level 1

Demonstrate knowledge and understanding of the principles of geographic information science and systems. This includes industry standard GIS, data structures, types and their applications, and of appropriate capture and output systems.

Examples of knowledge comprised within this level are:

- The generic concepts in GIS appropriate to different audiences
- Compare and contrast different commercial GIS software packages and explain their relative merits
- Proficiently operate at least one commercially available off-the-shelf GIS software package e.g. create, store, access, view, analyse and plot spatial data
- The data types and data structures used for spatial data and explain their relative merits
- The different open source and proprietary data formats and explain their relative merits
- Understand and be able to describe the different methods of primary, and especially secondary, data capture and their underpinning technologies
- The different output options and their underpinning technologies.

#### Level 2

Apply your knowledge and assess data quality; define and use appropriate input and data transfer methods; analyse data and prepare databases; identify digital data sources and assess 'fitness for use' as well as national and international data standards.

Examples of activities and knowledge comprised within this level are:

- Specifying capture methods appropriate to the data source and the application, explaining and justifying the rationale used
- Managing data capture projects and providing quality control over the acquisition of spatial data for use in GIS
- Understanding the principles underlying the analysis of spatial data and implement these with typical GIS algorithms using standard functionality and/or a high-level programming language
- Applying query languages in relation to database management systems e.g. data modelling, data loading, data maintenance, query, translate data formats, data export
- Identifying, assessing and sourcing datasets appropriate to user requirements and assessing their quality and fitness for purpose in the context of quantitative and qualitative measures such as: spatial resolution, accuracy/precision, temporal resolution, purpose of original capture etc.
- Understanding international de jure and de facto industry standards and how these apply in local jurisdictions and to local customs and practices

#### Level 3

Assess clients' needs and advise them accordingly. Define specifications including data and process modelling, customise systems, carry out advanced spatial analyses, and manage data and observe data standards.

Examples of activities and knowledge comprised within this level are:

- Designing and conducting user requirements analysis at consultancy level
- Analysing and synthesising user requirements into a coherent and convincing strategy
- Presenting, explaining and justifying findings and advice in a language appropriate to the customer
- Defining data standards to meet specific user requirements
- Analysing customer processes and presenting options to model these as appropriate with respect to availability of resources, criticality and customer expectations
- Customising GIS software using a high-level programming language to implement data specifications, data models, process models etc.
- Analysing, defining and implementing appropriate analytical methods
- Defining appropriate data management standards with respect to: currency requirements, conflict resolution, archiving, availability, backup and recovery, system resilience etc.
- Explaining all the above in the context of the customer's wider information systems

continued on next page

## GIS [Geographical Information Systems] [continued]

### Level 1



### Level 2

- Understanding metadata for third-party datasets and be able to prepare, creating and maintaining appropriate metadata for new datasets.

### Level 3

- Identifying and explaining the implications and limitations of advice with respect to any of the above
- Preparing project proposals and draft tender documentation for system procurement, conducting benchmark tests, and overseeing implementation programmes.

## Ground engineering and subsidence

Understanding of rock and soil mechanics and how these are applied to ground and slope stability problems. Understanding of natural and mining induced subsidence in terms of causation, effect, mitigation and remedies. Understanding of the methodology of large scale metrology (LSM), deformation monitoring and advising on appropriate instrumentation and survey methods.

### Examples of likely knowledge, skills and experience at each level

Level 1	Level 2	Level 3
<p>Undertake appropriate investigations including site inspection to research site history and geology.</p>	<p>Collate, analyse and interpret information gathered after initial research.</p>	<p>Provide evidence of reasoned advice, prepare and present reports.</p>
<p>Examples of knowledge comprised within this level are:</p> <ul style="list-style-type: none"> <li>• Soil and rock properties</li> <li>• Causation of natural and mining induced subsidence</li> <li>• Monitoring ground movement in a subsidence area using agreed/ specified survey instrumentation and methods</li> <li>• Monitoring the effect of ground movement on a building/structure</li> <li>• Calibration issues, ISO documentation and relevant RICS guidance and client guides.</li> </ul>	<p>Examples of activities and knowledge comprised within this level are:</p> <ul style="list-style-type: none"> <li>• Designing and implementing [in accordance with client brief] a monitoring survey scheme</li> <li>• Investigating geological and mining records to produce a report on causation of ground movement</li> <li>• Examining the options for minimising the risk of ground movement</li> <li>• Examining the amount of ground movement expected and the strains induced using appropriate LSM methods</li> <li>• Calibration issues and instrument capabilities</li> <li>• Producing a full statistical analysis of tall survey work, advising on appropriate output.</li> </ul>	<p>Examples of activities and knowledge comprised within this level are:</p> <ul style="list-style-type: none"> <li>• Producing a report on slope instability recommending means of minimising risk</li> <li>• Assisting with the preparation of an expert witness report on ground engineering/subsidence</li> <li>• Analysing the results of ground movement monitoring and producing a report with conclusions</li> <li>• Evaluating the options for treating subterranean voids and mine outlets and recommending a course of action.</li> </ul>

## Hydrographic surveying

Hydrographic surveying involves precise positioning and data acquisition in marine environments ranging from inland waters and rivers, to ports and the deep oceans. This competency involves the ability to provide precise three-dimensional position and measurement of various physical features within the marine environment such as bottom depth and structure, currents, tides and waves.

### Examples of likely knowledge, skills and experience at each level

#### Level 1

Demonstrate a working knowledge and understanding of the principles and limitations of hydrographic survey. Conduct measurements in the marine environment.

Examples of knowledge comprised within this level are:

- Providing navigation and data collection for oil, gas and mineral resource exploration and extraction
- Conducting data collection for environmental monitoring, aquaculture and oceanographic research
- Providing surveying support for dredging, coastal works, near-shore and/or off-shore construction projects
- Quality control and processing of hydrographic data
- Presenting hydrographic data using a range of paper [chart] and electronic formats.

#### Level 2

Plan the conduct of marine surveys, including taking into account safety issues. Specify appropriate instrumentation and ensure correct calibration. Understand the principles of geodesy on a local and international basis, and its application in a marine environment. Fully understand the principles, application and limitations of navigation, geophysical and marine survey instrumentation and software.

Examples of activities and knowledge comprised within this level are:

- Being actively involved in project initiation and execution as senior surveyor/navigator, including assessment of survey requirements, equipment specifications and suitability
- Conducting safety risk assessments and reviewing project safety plans for various activities
- Being responsible for, and ensuring that, equipment is fully calibrated and understanding the importance of calibration methods and the relationship to data quality
- Ensuring geodetic parameters specified for the project are correctly defined and implemented within acquisition software.

#### Level 3

Assess the client's needs and define specifications, tenders and/or contracts. Manage marine surveys. Analyse the data collected and use it to prepare reports and briefings. Be conversant with the International Law of the Sea and/or maritime boundaries.

Examples of activities and knowledge comprised within this level are:

- Assuming full responsibility for the initiation of the works in accordance with the approved project specific and standard survey procedures, customer requirements and technical specifications
- Preparing tender documents and being responsible for financial control of projects
- Liaising and advising clients regarding contract execution and having overall responsibility for the successful performance of the technical team
- Evaluating and presenting survey results and advising clients with respect to survey findings
- Assisting clients with their further requirements and helping develop future potential
- Advising clients on national/international policy and legislation and its influence on survey activities.



## Legal/regulatory compliance

Legal issues are at the heart of many areas of traditional land survey practice. All land surveyors should have a good working knowledge of any legislation which may impact on their work whether it be health and safety legislation in engineering surveying, land law and/or cadastral regulations or the law of the sea. Although land/engineering/hydrographic surveyors are not asked to be expert in legal matters, some are and many add expert witness training to their skillsets. For many international members and prospective members, this competency will be especially applicable in a cadastral context.

### Examples of likely knowledge, skills and experience at each level

#### Level 1

Demonstrate knowledge and understanding of any legal/regulatory compliance requirements in relation to your area of practice.

Examples of knowledge comprised within this level are:

- The legislative needs of land and marine survey work
- The basics of land law as applicable in your geographic location
- Legislative strictures such as health and safety legislation and/or traffic management
- Tort/contract law and its basic principles as applicable in your geographical area
- National land registration issues/legislation and cadastral laws.

#### Level 2

Apply your knowledge to comply with legal/regulatory requirements in specific situations within your area of practice.

Examples of activities and knowledge comprised within this level are:

- Apply your knowledge of land law in an international/national and/or regional scenario
- Apply your legal knowledge in a professional scenario such as a minor boundary dispute
- Relevant and applicable RICS guidance and practice notes in this area [such as Expert Witness]
- Expert Witness training
- Apply your knowledge in a cadastral context.

#### Level 3

Provide evidence of reasoned advice, prepare and present reports on legal/regulatory compliance requirements in relation to your area of practice.

Examples of activities and knowledge comprised within this level are:

- Apply your legal knowledge in a court scenario
- Prepare legal reports
- Advise on legislative obligations [health and safety etc.] to clients
- Advise clients of survey and mapping issues in combination with legal advice in boundary disputes
- Advise on other types of dispute such as party walls, right to light and subsidence
- Advise courts of mapping issues, explain complex surveying problems [map accuracy for example] to legal professionals
- Carry out cadastral surveys in compliance with national/regional legislation.

## Management of the natural environment and landscape

This competency is about the management of landscape and natural resources and habitat.

### Examples of likely knowledge, skills and experience at each level

#### Level 1

Demonstrate knowledge and understanding of the importance and role of nature conservation and the landscape in real estate, business management and development.

Examples of knowledge comprised within this level are:

- Landscape and designations and agri-environmental schemes
- Relevant legislation governing designation schemes
- Bodies charged with bringing in and delivering such legislation
- Legislative drivers behind Sites of Special Scientific Interest (SSSIs) and other designated areas
- The impact of spatial data and land law on conservation and the natural environment.

#### Level 2

Apply your knowledge of nature conservation and landscape in the management of real estate and development.

Examples of activities and knowledge comprised within this level are:

- Advising on grants available for protection of landscape and natural habitat and natural resources
- Advising on mapping and survey specifications relating to nature conservation and landscape
- Advising on spatial issues which may impact on nature conservation (i.e. rights of access).

#### Level 3

Provide evidence of reasoned advice, write reports and negotiate on all matters relating to nature conservation and landscape.

Examples of activities and knowledge comprised within this level are:

- Providing strategic advice on land use, management practice, and management of specific habitats and species
- Interpreting and filtering advice
- Providing balanced report writing to provide overarching view of management of a landscape.

## Measurement

This competency is relevant to all data capture and surveying/measurement areas of practice. Particularly, land survey, engineering survey and measured building survey.

### Examples of likely knowledge, skills and experience at each level

Level 1	Level 2	Level 3
<p>Demonstrate knowledge and understanding of the principles and limitations of measurement relevant to your area of practice.</p> <p>Examples of knowledge comprised within this level are:</p> <ul style="list-style-type: none"> <li>All checking procedures and be able to ascertain the suitability of different instrumentation and measurement techniques</li> <li>The principles of error sources</li> <li>Data capture techniques and limitations of use</li> <li>Different basic survey instrumentation (EDMs, automatic levels, lasers etc.)</li> <li>The principles of data representation and the use of appropriate data capture techniques to achieve agreed survey output.</li> </ul>	<p>Apply your knowledge to undertake measurement. Use basic and/or advanced instrumentation to collect data. Present appropriate information gained from measurement.</p> <p>Examples of activities and knowledge comprised within this level are:</p> <ul style="list-style-type: none"> <li>Using advanced data capture instrumentation such as reflectorless EDM, GPS, handheld GIS data capture tools etc.</li> <li>Understanding the principles of measured building surveying and its outputs</li> <li>Understanding the differences between different data capture techniques and their fitness for purpose</li> <li>Producing final output and utilising post processing techniques</li> <li>Understanding specifications and guidance.</li> </ul>	<p>Evaluate, present, manage, analyse data and/or apply spatial data and information. Show an advanced understanding of accuracy, precision and error sources.</p> <p>Examples of activities and knowledge comprised within this level are:</p> <ul style="list-style-type: none"> <li>Being fully conversant with all RICS geomatics specification and guidance and other official RICS guidance as appropriate to your area of practice</li> <li>Appreciating all legislative issues such as health and safety</li> <li>Advising on appropriate data capture techniques</li> <li>Explaining complex survey data capture techniques and terminology to clients</li> <li>Describing the principles of metadata and property data information and compatibility.</li> </ul>

## Planning development and management

Planning appraisal is one of the crucial starting points in the development or refurbishment process. Such appraisals draw together all the relevant policies and site history as pertaining to a site. A planning brief or supplementary planning document may also be used to stimulate interest in development or provide guidance or mandatory criteria by which a scheme may be developed. They may be used in conjunction with an allocated site in a development plan or a site being promoted by a land owner for sale. Both provide a framework and guide for developers in the preparation of development schemes. Development management covers the process of managing or obtaining the grant of planning consents from the local authority or client-side perspective. The competency also covers the appeals process and the criteria by which cases will be considered by inspectors.

### Examples of likely knowledge, skills and experience at each level

#### Level 1

Demonstrate knowledge and understanding site inspection and evaluation and the information required to prepare a planning, design and/or development brief and/or to submit a planning application or appeal.

Examples of knowledge comprised within this level are:

- Site/building surveys and details e.g. site planning history, flood risk, biodiversity, archaeology, architectural character, conservation, accessibility, highways, services and utilities
- Environmental features and issues
- Gross and net site development areas
- Urban design principles and characteristics
- Basic architectural and urban design language in relation to planning proposals
- The objectives and characteristics of different kinds of brief
- The stages of the development application and appeals process
- The consultation process and stakeholder management
- The role of supplementary planning documents, design guides and codes in guiding planning applications and their consideration.

#### Level 2

Apply your knowledge to identify, select, assemble and analyse information relevant to the preparation of briefs.

Examples of activities and knowledge comprised within this level are:

- Producing a planning, design and development brief and/or supplementary planning guidance
- Prepare/make presentations at meetings
- Support the making of planning applications and appeal documentation
- Selecting, researching and analysing information and data and writing reports
- Programming or phasing of the stages of development
- Producing a risk analysis
- Identify and help ensure compliance with planning policies and guidance
- Support the preparation of a design and access statement.

#### Level 3

Apply information and reasoned advice in the preparation, presentation and /or negotiation of site evaluation reports, planning application and appeals documentation, planning and development briefs or more detailed design briefs, or parts thereof.

Examples of activities and knowledge comprised within this level are:

- Liaising with and negotiating with planning and estates officers, clients, fellow professionals and third-party stakeholders in relationship to a development project
- Using a brief to assist in the promotion and/or design and implementation of a development scheme or a site disposal or acquisition
- Preparing planning appraisals of land, buildings and concepts and area wide planning parameter studies
- Making a planning application and/or submitting an appeal and appearing at an informal or public inquiry
- Lead the preparation or write a design and access statement
- Planning and phasing the implementation of a development scheme
- Formulating and negotiating a planning or highways agreements
- Creativity, problem solving and dispute mediation in scheme development.

## Remote sensing and photogrammetry

Remote sensing and photogrammetry are activities and methods within the Geomatics profession related to provision of spatial information. This involves using photographs and digital imagery to provide information about the Earth’s surface and changes which occur within the landscape. It also covers the science and technology of making precise measurements on the imagery to model, in three dimensions, the landscape and features or structures on the Earth’s surface.

### Examples of likely knowledge, skills and experience at each level

#### Level 1

Demonstrate knowledge and understanding of the principles of remote sensing and photogrammetry (both aerial and terrestrial).

Examples of knowledge comprised within this level are:

- Principles of photogrammetry
  - Camera geometry – scales, precision, ground sample distance
  - Properties of photography – principal point, radial properties
- Principles of remote sensing
  - Sensors – geometric characteristics
  - Image processing
- Types of imagery, the source of acquisition, and their practical application
  - Remote sensed data – infra-red, panchromatic, colour, thermal
  - Stereo photography and the requirements to achieve 3D measurement
  - Oblique photography
  - Ortho-photography [true, ortho-rectified, geo-rectified].

#### Level 2

Apply your knowledge and understanding of scales, camera and satellite principles and different data capture techniques. Understand and undertake procedures for routine data capture, and analyse and/or adjust/transform data. Use standard industry software.

Examples of activities and knowledge comprised within this level are:

- Interpreting of specifications
- Setting up equipment – resolving interior and exterior orientations
- Providing ground control – aerial triangulation
- Digital Surface Modelling – techniques
- 3D data capture.

#### Level 3

Provide evidence of fit-for-purpose advice on client requirements. Identify and assess client specifications. Use advanced industry software and advise on data transfer and/or format.

Examples of activities and knowledge comprised within this level are:

- Providing reasoned advice on tenders and contracts
- Comparing and advising on benefits of alternative methodology
- Project design and drafting of quality plans and method statements
- Project and contract management
- Producing reports, error detection and analysis.

## Surveying and mapping

Mapping, in this context, is an exceptionally broad potential area of practice. Encompassing everything from LIDAR, IFSAR, aerial photography and other primary data capture techniques to ground control using GPS and/or traditional techniques and the production of digital elevation models, DTMs or any form of geographical output including GIS data capture and output.

### Examples of likely knowledge, skills and experience at each level

#### Level 1

Demonstrate knowledge and understanding of the principles of mapping and geographic information sciences appropriate to your area of practice, including the accuracy, scale, currency and fitness for purpose of hardcopy and/or digital maps, drawings, imagery and plans.

Examples of knowledge comprised within this level are:

- The limitations of use of spatial data capture instrumentation and techniques
- Instrument checking techniques
- The basic principles of geodesy and its application to mapping per your area of practice
- Basic survey software
- Data quality and checking criteria and techniques
- The issues around visual representation of spatial data and its relationship with data capture techniques
- Understand scalability, fitness for purpose and accuracy constraints.

#### Level 2

Apply your knowledge of mapping and geographical sciences in relation to your area of practice, including data capture error sources, instrument calibration and limitations. Use mapping/cartographic survey software, understand production processes and digital data capture (scanning and/or digitisation), and carry out surveys through to the end product.

Examples of activities and knowledge comprised within this level are:

- Using post processing survey/mapping software competently
- Using survey industry standard software and post processing techniques
- Understanding the principles of data integration and compatibility, integrating different data sets to achieve client needs
- Understanding scalability in the context of both mapping and user requirements
- Using imagery software and GIS data capture tools
- Using modern survey instrumentation and understanding checking/calibration techniques
- A good understanding of error sources, probability and statistical analysis according to your area of practice
- Being fully conversant with the production of digital terrain models, digital elevation modelling and data integration techniques (overlaying OS map layers with surveyed topographical data for example)
- Understanding survey contracts and specifications (in conjunction with senior colleagues).

#### Level 3

Provide evidence of reasoned advice on the design and specification of mapping and/or geo-information projects in a national and/or international context.

Examples of activities and knowledge comprised within this level are:

- Using all forms of survey/mapping/imagery contracts competently and describing the nuances of each (i.e. accuracy/fitness for purpose issues)
- Being fully conversant with all RICS Geomatics specifications and guidance in relation to mapping
- Explaining complex mapping issues to clients and discerning their 'actual' needs.

## Surveying land and sea

This competency covers aspects of both terrestrial and marine surveying. It involves the collection, processing, analysis and dissemination of geospatial data.

### Examples of likely knowledge, skills and experience at each level

#### Level 1

Demonstrate knowledge and understanding of the principles of geomatics and the various applications of its techniques within the natural, maritime and built environments.

Examples of knowledge comprised within this level are:

- Conducting marine navigation and offshore data collection for exploration and exploitation purposes
- Collecting and quality controlling spatial data for control networks and/or topographic detail surveys
- Conducting engineering surveys to provide dimensional control, setting out and QA checks for the construction industry
- Collecting and/or manipulating data for a specific use within a Geographic Information System
- Conducting Photogrammetric measurements (2D or 3D) from photographs or imagery stored electronically.

#### Level 2

Apply your knowledge by identifying, planning and accessing survey requirements, specifications and appropriate instrumentation. Use industry standard survey and/or offshore software, and demonstrate an understanding of the principles, uses and limitations of Global Navigation Satellite Systems and other navigation systems.

Examples of activities and knowledge comprised within this level are:

- Being responsible for and ensuring that survey equipment is fully calibrated, and understanding the importance of calibration methods and the relationship to data quality
- Undertaking post-process GNSS observations and performing adjustments within a network
- Performing datum transformations and understanding the relationship between local datum and global datums
- Being involved in project initiation and execution as Senior Surveyor including assessment of survey requirements, equipment specifications and suitability
- Working directly with program managers, software development engineers, and testers to write documentation that helps customers understand and use a GIS system.

#### Level 3

Define and assess client needs. Define specifications and prepare tenders and/or contracts. Demonstrate that you are fully conversant with the principles of geodesy on a national, international and/or maritime basis.

Examples of activities and knowledge comprised within this level are:

- Assuming full responsibility for the initiation of a survey in accordance with the approved project specific and standard survey procedures, customer requirements and technical specifications
- Sourcing, managing and assessing survey contractors performing work on your behalf
- Helping to create the overall direction, strategy, and coordination for the business development and marketing of a GIS product and service
- Advising clients upon coastal processes and the potential impact of any activity and/or construction in the nearshore environment.
- Advising clients on national/ international policy and legislation and its influence on survey activities.

## Use of the marine environment

This competency covers the wide range of sea area usage; application of national and international legislation; conducting data acquisition and analysis. It also involves presenting professional and scientific reports, assisting in sea area evaluation and the preparation of planning applications. Additionally, it incorporates assistance provided to clients in respect of marine exploitation, with due regard to the environment.

### Examples of likely knowledge, skills and experience at each level

#### Level 1

Demonstrate an understanding of the principles of inshore and offshore resource development, exploitation and/or Conservation, including the relevant legal guidance and environmental issues.

Examples of knowledge comprised within this level are:

- The global distribution of physical, biological and chemical resources within the sea, upon and beneath the seabed that may be of value to humankind
- The role of economic markets, property rights and market structures
- The range of sea area utilisation and the concept of conflict management
- The concepts of sustainable development.

#### Level 2

Apply these principles to planning for the exploitation and/or use of marine resources. Use appropriate marine data capture and analysis software and/or instrumentation.

Examples of activities and knowledge comprised within this level are:

- Determining appropriate assessment techniques for sea area valuation
- Planning and executing a marine survey in order to determine economic yield, seabed topography, ecology and/or geophysical structure
- Undertaking water quality and movement observations and analysis
- The application and limitations of different data acquisition equipment
- Displaying acquired data within a range of paper and electronic media formats.

#### Level 3

Oversee the conduct of operations to use and/or exploit marine resources. Analyse the data collected and prepare reports and briefings on the data collected. Advise on national and international policy on ocean and inshore resource management.

Examples of activities and knowledge comprised within this level are:

- Liaising with and advising clients on project planning
- Conducting project management both pre, post and during development projects
- Evaluating and presenting survey results with respect to planned sea area usage within scientific reports
- Advising clients in lay terms on project findings
- Applying national and international policy to future developments.





## Confidence through professional standards

RICS promotes and enforces the highest professional qualifications and standards in the valuation, development and management of land, real estate, construction and infrastructure. Our name promises the consistent delivery of standards – bringing confidence to markets and effecting positive change in the built and natural environments.

### Americas

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