

Associate Assessment

Geospatial Surveying August 2017

Geospatial Surveying

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Introduction

In order to become an RICS Associate you must demonstrate that you have knowledge, understanding and practical ability relevant to a surveying role – in this case, Geospatial Surveying.

This guide explains the competencies for your pathway, with examples of how you can show you meet the requirements.

Refer to this guide while preparing your submission for assessment.

The **Associate Assessment Candidate Guide** gives further essential information on how to prepare for the assessment.

Competencies

A competency is the knowledge, skills, abilities and behaviours needed for a particular role or task. RICS competencies equip you to work in your chosen pathway.

The six technical competencies are the pathway-specific 'hard' skills needed for your role.

The eight mandatory competencies are the 'soft' business skills demonstrating your ability to work with colleagues, manage workloads and act with integrity. All candidates, regardless of their pathway, need these skills.

What is Geospatial Surveying?

This 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.

Geomatics is one of the fastest expanding global markets and a truly worldwide profession. Driven by technology and maintaining its role in land law and other socio-economic areas, leading chartered surveying firms realise the importance of geomatics, not only to the profession but to the future success of their businesses. This is particularly true in the day-to-day integration of geomatics with traditional forms of real estate management, land administration and construction.

The changing nature of mapping and spatial data management worldwide includes rapid advancements in Information Technology (e.g. GIS, Global Navigation Satellite Systems, 'joined up government' initiatives, digital cadastres and many more).

Geomatics is a diverse and complex area of practice and to reflect this, there are two pathways: one orientated towards Geospatial Surveying and one for Hydrographic Surveying.

The Geospatial Surveying pathway is primarily aimed at those candidates who do not spend the majority of their employment offshore and/or engaged in hydrographic surveying. Although chiefly aimed at those in 'traditional' land and engineering survey, this pathway can also be taken by those in government agencies and those from more specialised areas of geomatics practice such as measured building surveys and utilities surveying.

The Hydrographic Surveying pathway is designed for those who work within a hydrographic/marine survey environment. This could be based offshore or on land (charting, post processing bathymetry for example).

Geospatial Surveying competencies

You must select any **six** of the following **ten** technical competencies:

- building information modelling (BIM) management
- cadastre and land management
- engineering surveying
- Geodesy
- GIS
- legal/regulatory compliance
- mapping
- measurement of land and property
- property records/information systems
- remote sensing and photogrammetry.

You must complete all **eight** mandatory competencies:

- client care
- communication and negotiation
- conduct rules, ethics and professional practice
- · conflict avoidance, management and dispute resolution procedures
- data management
- health and safety
- sustainability
- teamworking.

Technical competencies

Building information modelling (BIM) management	
Description	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).
Requirements	Demonstrate knowledge and understanding of the technical, process and collaborative aspects of the use of BIM on projects. Develop and apply management systems to facilitate the use of BIM on projects including unified control and reporting procedures.
Examples of likely skills, knowledge and experience	 Knowledge Understanding appropriate data capture and measurement techniques such as laser scanning Understanding of BIM strategies and implementation Understanding of the various technical options and solutions for information modelling Understanding of the collaborative processes necessary for BIM adoption Knowledge of standard classification systems and their use in infrastructure Knowledge of relevant internationally recognised management standards such as Construction Operations Building Information Exchange (COBie) Understanding appropriate RICS guidance such as Measured Surveys 3rd edition guidance note 2014 Understand BIM relevant software such as RIVET Activities Preparing a BIM execution plan with an emphasis on geospatial requirements Designing, implementing and future proofing a BIM management process Analysing comparative BIM solutions and different data sources
Examples of tasks undertaken	 Capturing and delivering appropriate measured survey information (Point Cloud, .DXF, 3D models etc) as necessary to build a specified BIM model Maintaining an information model Agreeing and implementing contractual aspects of BIM use Facilitating and managing project team members for BIM implementation

Cadastre and land management	
Description	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 should be noted that non-UK candidates may work within a cadastre and that their potential working environment may be significantly different from the UK. This competency reflects this diversity within the 'examples of activities'.
Requirements	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. 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 likely skills, knowledge and experience	 knowledge property registers in use plans relating to the registration process limitations of national mapping definition of extent of registered title' paper-title (the deeds) status of a deed plan when referred to in the text of a deed common law presumptions regarding property boundaries law relating to 'moving boundaries' accretion, foreshore all relevant, existing and up to date RICS guidance and professional information such as 'RICS GN - Boundaries 2nd Ed 2009' and/or the relevant local land law and cadastral procedures the requirements for Determining Boundaries (UK only). Activities preparing an initial boundary report compiling and using a variety of sources from old deeds to modern downloadable title plans and land registry information adopting appropriate scales for measured surveys to be used in cadastre using and interpreting aerial photography and digital imagery researching and evaluating initial cadastral issues re-establishing boundary markers basic reporting on potential issues of 'encroachment' surveying of boundary markers reporting on land purchase and basic valuation preparing an land purchase and basic valuation

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Cadastre and land management	
Examples of tasks undertaken	 client relationships initial specification of any proposed measured survey instrumentation and checking measured survey field work and post survey data output applications of land law from easements to entering a person's land communication with relevant authorities for issues of legal title (land registry), mapping (relevant national mapping agency) and/or client measured survey of site using appropriate equipment and subsequent data management and output choosing which documentation to rely upon practising with complete independence from the client requesting documents from the legal profession.

Engineering surveying	
Description	Engineering surveying is the art and science 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.
Requirements	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. Apply your knowledge on site and be aware of safety, site management procedures and civil engineering/structural principles.
Examples of likely skills, knowledge and experience	 Knowledge 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 instrumentation, appropriate use of such and checking procedures comparison of designed and as-built spatial locations construction drawings, plans and surveys health and safety issues basic principles of civil engineering, terminology and construction techniques appropriate use of industry guidance, specifications and related professional information surveys of quarries, spoil heaps and landfills and associated volume calculations. Kotivities identifying hazards and undertaking risk assessments, basic health and safety management producing method statements for site survey activities depending on project size and nature, installation and checking of primary survey control network and benchmarks construction site setting out, including structures, highways, drainage and tunnels, and extension of survey control
Examples of tasks undertaken	 recognising options, choosing and justifying instrument suitability for use in engineering projects accuracies and errors and how they apply communicating and presenting results of surveys to others initial site survey including installation of temporary survey control such as temporary bench marks use of traditional and/or Global Positioning System survey techniques (for example earth moving) depending on project nature - steel drawing control, survey management and control of high rise structures (structural steel, slip-forms) daily management of routine survey tasks as-built surveys and output (digital and/or hardcopy) including issues of scale and survey specification basic control of construction resources - labour, material (concrete ordering and checking) deformation monitoring of ground or structures.

Geodesy	
Description	Geodesy is an interdisciplinary science which uses remotely sensed and ground-based measurements to study the shape and size of the earth and their temporal variations. Geodesy also includes the study of the earth's gravity field. Geodesy can be divided into: geomensuration, which is concerned with measuring the earth on a global scale, and surveying, which is concerned with measuring parts of the surface. Understanding the key elements of Geodesy is a primary skill required by land and hydrographic surveyors.
Requirements	Demonstrate knowledge and understanding of the principles of geodesy, Global Navigation Satellite Systems, global/regional/national geodetic reference systems, geoids, datums and projections. Apply your knowledge in practice, specify and plan surveys and instrumentation needs. Be aware of error sources and 'fitness for purpose' of data. Use industry standard software and apply network adjustments and/or transformations.
Examples of likely skills, knowledge and experience	 Knowledge the difference between the geoid and ellipsoid the differences between types of projections the applications and limitations of Global Navigation Satellite Systems datums technology advances and the advent of new Global Navigation Satellite Systems such as Galileo and Compass and the re-structuring of existing systems such as Global Positioning System and Glonass industry guidance, specifications and related professional information 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 the various modes of Global Navigation Satellite Systems positioning [i.e. static, rapid static, kinematic, real-time kinematic in relation to survey planning and meeting of specifications]. Activities using Global Navigation Satellite Systems surveys to appropriate levels of accuracy, including data processing planning and executing Global Navigation Satellite Systems surveys to appropriate levels of accuracy, including data processing using standard commercial Global Navigation Satellite Systems processing packages to process Global Navigation Satellite Systems data and to apply pre-determined transformation routines to transform Global Navigation Satellite Systems based co-ordinates to national datums.
Examples of tasks undertaken	 specifications required for the task control of accuracy and appropriate choice and use of geodetic hardware and software mitigation of error sources background research into the existing geodetic framework in the area of work processes employed to combine an existing geodetic framework with a new survey scheme.

GIS	
Description	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 socio-economic characteristics. Beginning with a digital dataset 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.
Requirements	Demonstrate knowledge and understanding of the principles of geographic information science and systems. Be aware of industry standard GIS, data structures, types and their applications, and of appropriate capture and output systems. 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'. Understand and be aware of national and international data standards.
Examples of likely skills, knowledge and experience	 Knowledge the generic concepts in GIS appropriate to different audiences tabular, raster and vector data the different methods of primary and, especially, secondary data capture the different output options geodetic issues such as datums, projections industry guidance, specifications and related professional information the principles underlying the analysis of spatial data and how to implement these with typical GIS algorithms using standard functionality data industry standards and metadata. Activities operating at least one commercially available off-the-shelf GIS software package e.g. create, store, access, view, analyse and plot spatial data undertaking data capture such as digitising from maps and plans or address matching undertaking data integration such as plotting of a measured survey on to a topographical map or importing and processing point based data sources applying quality control procedures to ensure data quality and integrity applying data management procedures such as updates to base data, control of access to data, publication to users and documentation of it selecting and performing data capture appropriate to user requirements and assessing their quality and fitness for purpose.
Examples of tasks undertaken	 assessment of most appropriate output such as product type, scale, content and resolution of mapping to be used import and export of different formats according to user needs e.g. exporting data from GIS data store for CAD users or importing data from other systems spatial analysis of several layers of data using both database and spatial queries and subsequently providing results for adding to a report or presentation e.g. geology/soils survey with contaminated land data and flood mapping.

Legal/regulatory compliance	
Description	Legal issues are at the heart of many areas of traditional land survey practice. All land/engineering surveyors should have a good working knowledge of any legislation that may impact on their work whether it is health and safety legislation in engineering surveying, land law and/or cadastral regulations. This competency will be especially applicable in a cadastral context.
Requirements	Demonstrate knowledge and understanding of any legal/regulatory compliance requirements in relation to your area of practice. Apply your knowledge to comply with legal/regulatory requirements in specific situations within your area of practice.
Examples of likely skills, knowledge and experience	 Knowledge legislative needs of land survey work the basics of land law legislative strictures such as health and safety legislation and/or traffic management contract law and its basic principles national land registration issues/legislation and cadastral laws RICS and survey industry guidance, specifications and related professional information. Activities surveying under the current regulations, licensing and laws applicable to your location undertaking a risk assessment in the office/field.
Examples of tasks undertaken	boundary dispute, wayleaves or planning application.

Mapping	
Description	Mapping, in this context, is an exceptionally broad potential area of practice. It encompasses everything from light detection and ranging, interferometric synthetic aperture radar, aerial photography and other primary data capture techniques to ground control using Global Positioning System and/or traditional techniques and the production of digital elevation models, digital terrain models or any form of geographical output including GIS data capture and output.
Requirements	Demonstrate knowledge and understanding of the principles of mapping and geographic information sciences appropriate to your area of practice. Be aware of accuracy, scale, currency and fitness for purpose of hardcopy and/or digital maps, drawings, imagery and plans. Apply your knowledge of mapping and geographical sciences in relation to your area of practice.
Examples of likely skills, knowledge and experience	 Knowledge data capture techniques and the issues regarding accuracy and precision cartographic standards basic principles of Geodesy and mapping use of basic survey and mapping software map generalisation issues and potential effect on data representation potential pitfalls of scale issues map projection scale factor RICS and survey industry standard guidance and information online mapping resources and data integration (mash ups) the principles of data integration and compatibility, integrating different data sets to achieve client needs. Activities using post processing survey/mapping software using digital terrain modelling/digital elevation models.
Examples of tasks undertaken	 co-ordinate systems and transformations for mapping assessment of most appropriate output such as product type, scale, content and resolution of mapping to be used applying quality control procedures to ensure data quality and integrity utilisation of industry standard CAD, Imagery and GIS software for presentation of final data quality assurance flowline to ensure that final data is produced according to the specification choice of mapping product appropriate for project considering accuracy and reliability scalability in the context of both mapping and user requirements.

Measurement of land and property	
Description	This competency is relevant to all data capture and surveying/measurement areas of practice, particularly, topographic land survey, engineering surveying and measured building survey. It is also relevant to boundary surveys, surveys for rental, ratings and valuations, initial field visit surveys and high accuracy as-built surveys or large-scale utilities surveys.
Requirements	Demonstrate knowledge and understanding of the principles and limitations of measurement relevant to your area of practice. Apply your knowledge to undertake measurement. Use basic and/or advanced instrumentation to collect data. Present appropriate information gained from measurement.
Examples of likely skills, knowledge and experience	 Knowledge checking procedures, the suitability of different instrumentation and measurement techniques principles of error sources data capture techniques and limitations of use different basic survey instrumentation principles of data representation and the use of appropriate data capture techniques to achieve agreed survey output principles of measured building surveying and its outputs RICS and survey industry standard guidance and information. Activities planning measurement strategy equipment checking applying quality assurance procedures using data capture instrumentation employing measured building survey techniques using topographical survey data capture techniques and appropriate output criteria.
Examples of tasks undertaken	 initial site survey including installation of survey control points survey output (digital and/or hardcopy) including issues of scale and survey specification final output using post processing techniques.

Property records/information systems	
Description	This competency relates to the records that must be maintained to support a country's system of registration of rights, responsibilities and restrictions in its land. It requires knowledge and understanding of the systems in use in one country, usually the country in which the candidate works Non-UK candidates may work within a cadastre and their potential working environment may be significantly different from the UK. This competency reflects this diversity within the activities section.
Requirements	Demonstrate knowledge and understanding of the factors required for property records/information systems, including the sourcing and collation of data. Demonstrate your ability to apply knowledge to analyse data and assemble it for use in a database.
Examples of likely skills, knowledge and experience	 Knowledge difference between deeds/registered titles general/surveyed boundaries supporting maps/plans legal documentation index maps electronic records RICS and survey industry guidance, specifications and related professional information. Activities compiling a case file of appropriate documentation. etstablishing and/or reporting on land administration issues such as rights of access, easements, wayleaves, restrictive/positive covenants, planning/development issues, land obligations or any other specific land law issues applying quality control procedures plotting from information contained in deeds recording metadata for project conducting survey/field investigation interpreting plan/map whilst on site, writing report from survey containing results communicating with relevant authorities interpreting legal language in relation to property records accessing basic legal advice developing a record for integration into an accepted national and/or local cadastral system gathering data, historic or recent, on the cadastral parcel/record initiating research into legal and boundary issues which may result from property record transfer.
Examples of tasks undertaken	 analysis of deed plans interpretation of map and legal wording and in relation to legal estates investigation of deeds, and plans in relation to easements, rights of way and burdens affecting the land choice of mapping product appropriate for project considering accuracy and reliability.

Remote sensing and photogrammetry	
Description	Remote sensing and photogrammetry are activities and methods 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.
Requirements	Demonstrate knowledge and understanding of the principles of remote sensing and photogrammetry (both aerial and terrestrial). Apply your knowledge and be aware 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 likely skills, knowledge and experience	 Knowledge basic principles of photogrammetry camera geometry - scales, precision, ground sample distance properties of photography principles of remote sensing sensors - geometric characteristics image processing types of imagery, the source of acquisition, and their practical application ortho-photography (true, ortho-rectified, geo-rectified) RICS and survey industry guidance, specifications and related professional information. Activities liaising with client and internal management of survey/mapping procedures processing of airborne Global Positioning System/Inertia Measurement Unit data, Light Detection and Ranging point clouds and digital imagery interpreting specifications setting up equipment co-ordinating systems and transformations processing of analogue and digital imagery using photogrammetric and imagery software.
Examples of tasks undertaken	 assessment of most appropriate output such as product type, scale, content and resolution of mapping to be used digital surface modelling techniques 3D data capture operation and calibration sensors quality control procedures utilised to ensure final data is fit for purpose.

Mandatory competencies

Title	Requirement
Client care	 Demonstrate knowledge and understanding of the principles and practice of client care including: the concept of identifying all clients/colleagues/third parties who are your clients and the behaviours that are appropriate to establish good client relationships the systems and procedures that are appropriate for managing the process of client care, including complaints the requirement to collect data, analyse and define the needs of clients. Demonstrate practical application of the principles and practice of client care in your area of practice.
Communication and negotiation	Demonstrate knowledge and understanding of effective oral, written, graphic and presentation skills including the methods and techniques that are appropriate to specific situations. Demonstrate practical application of these skills in a variety of situations, specifically including where negotiation is involved.
Conduct rules, ethics and professional practice	Although this is demonstrated through the RICS ethics module (see Candidate Guide) you should still refer to it (where applicable). Demonstrate knowledge and understanding of the role and significance of RICS and its functions. Also an appreciation of your personal professional role and society's expectations of professional practice and RICS Rules of Conduct and regulations, including the general principles of law and the legal system, as applicable in your country of practice. Demonstrate practical application in your area of practice, being able to justify actions at all times and demonstrate personal commitment to the RICS Rules of Conduct and RICS ethical standards. Demonstrate that you have applied these in the context of advising clients.
Conflict avoidance, management and dispute resolution procedures	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.
Data management	Demonstrate knowledge and understanding of the sources of information and data, and of the systems applicable to your area of practice, including the methodologies and techniques most appropriate to collect, collate and store data.
Health and safety	Demonstrate knowledge and understanding of the principles and responsibilities imposed by law, codes of practice and other regulations appropriate to your area of practice. Demonstrate practical application of health and safety issues and the requirements for compliance, in your area of practice.
Sustainability	Demonstrate knowledge and understanding of why and how sustainability seeks to balance economic, environmental and social objectives at global, national and local levels, in the context of land, property and the built environment.
Teamworking	Demonstrate knowledge and understanding of the principles, behaviour and dynamics of working in a team.

Continuing professional development (CPD)

In your submission document you must record 48 hours of CPD, this must be 12 months prior to your associate assessment. The following are examples of the type of development relevant to this pathway.

Mapping; Geodesy; Engineering surveying						
Activity type	Purpose	Description	Learning outcomes			
Work-based	To develop my knowledge of new surveying equipment	Attended in-house training workshop on latest Global Navigation Satellite System and Global Positioning System equipment and software	I developed an awareness of the uses and capabilities of the latest GNSS receivers. My company hired/purchased and carried out a number of short tutorials on the included software			
Engineering surveying						
Activity type	Purpose	Description	Learning outcomes			
Work-based	To develop my understanding of basic site health and safety	Internal site health and safety course run by external organisation. Completed online tutorial on legal aspects of health and safety	I have an understanding of the need to properly ascertain health and safety issues before starting survey work on site I have a better understanding of the legislation behind health and safety and how it impacts surveyors			

Property records/information systems					
Activity type	Purpose	Description	Learning outcomes		
Organised	Strengthen my knowledge of the latest thinking on property records, databases and related industry examples	CPD Lecture – held at RICS by a leading international expert in land registration and cadastre	I learnt that with property records/ information systems there is so much to learn about how services to the public can be improved		
Remote sensing and photogrammetry					
Activity type	Purpose	Description	Learning outcomes		



Confidence through professional standards

RICS promotes and enforces the highest professional qualifications and standards in the development and management of land, real estate, construction and infrastructure. Our name promises the consistent delivery of standards – bringing confidence to the markets we serve.

We accredit 125,000 professionals and any individual or firm registered with RICS is subject to our quality assurance. Their expertise covers property, asset valuation and real estate management; the costing and leadership of construction projects; the development of infrastructure; and the management of natural resources, such as mining, farms and woodland. From environmental assessments and building controls to negotiating land rights in an emerging economy; if our professionals are involved the same standards and ethics apply. We believe that standards underpin effective markets. With up to seventy per cent of the world's wealth bound up in land and real estate, our sector is vital to economic development, helping to support stable, sustainable investment and growth around the globe.

With offices covering the major political and financial centres of the world, our market presence means we are ideally placed to influence policy and embed professional standards. We work at a cross-governmental level, delivering international standards that will support a safe and vibrant marketplace in land, real estate, construction and infrastructure, for the benefit of all.

We are proud of our reputation and we guard it fiercely, so clients who work with an RICS professional can have confidence in the quality and ethics of the services they receive.

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