

**Appendix to Membership Policy**

**Competencies for NZIS Membership**

Dated 12 Sept 04

Competency		Disciplines									
		(a) Cadastral Surveying	(b) Non-cadastral Surveying	(c) Land Development and Land Devlmt Engineering	(d) RM Planning	(e) Geodetic Surveying	(f) Mining Surveying	(g) Hydrographic Surveying	(h) Photo- grammetry	(i) Remote Sensing	(j) GIS
Note - Competencies in column (a) meet the CSLB requirements as at Aug 2004											
<b>Item</b>	<b>Demonstrate an understanding of, or ability to:</b>										
<b>1</b>	<b>Survey Measurement</b>										
1.1	The theory and application of the scientific principles of plane surveying, geodetic surveying, remote sensing and photogrammetry.	Yes	Yes			Yes	Yes	Yes	Yes	Yes	Yes
1.2	Properly use and calibrate survey equipment to ensure correct measurement and the minimisation of errors.	Yes	Yes			Yes	Yes	Yes			Yes
1.3	Record and document measurements and other survey observations accurately.	Yes	Yes			Yes	Yes	Yes	Yes		Yes
1.4	Apply appropriate measuring equipment, methods and techniques, processing and eliminating material measurement errors, and methods of correcting and adjusting measurements.	Yes	Yes			Yes	Yes	Yes	Yes	Yes	Yes
1.5	Apply statistical and mathematical analysis; to make appropriate geodetic and plane network adjustments, map projection corrections, corrections to GPS observations, and rectify terrestrial aerial photographs and images.	Yes	Yes			Yes	Yes	Yes	Yes	Yes	Yes
1.6	Coordinate transformations and relate measurements to the geodetic reference systems and datums.	Yes	Yes			Yes	Yes	Yes	Yes	Yes	Yes
1.7	Interpret and determine topographic and hydrographic features relevant to the definition or location of boundaries.	Yes	Yes	Yes			Yes	Yes	Yes	Yes	Yes
1.8	Topographic surveying and methodologies.		Yes				Yes				
1.9	Complete an as-built survey of completed engineering works.		Yes				Yes				
1.10	Complete surveys to precisely set out buildings and constructions works (horizontal and vertical).		Yes				Yes				
1.11	Precise levelling.		Yes			Yes	Yes	Yes			
1.12	GPS theory and practical use.	Yes	Yes			Yes	Yes	Yes	Yes		Yes
1.13	BOMA surveys of buildings.		Yes								
1.14	Monitoring - horizontal and vertical.		Yes			Yes					
1.15	Height-to-boundary and certification of works.	Yes	Yes								
1.16	Survey control for photogrammetric purposes.		Yes						Yes		
1.17	Use survey-specific software applications	Yes	Yes	Yes		Yes	Yes	Yes			
1.19	Determine azimuth from astronomical observations	Yes				Yes		Yes			
<b>2</b>	<b>Land Law</b>										
2.1	Central and local government legislation and processes that affect land tenure, including an understanding of the relevance of district and regional plans to subdivision of land.	Yes		Yes	Yes		Yes	Yes			
2.2	The legislation and administration processes relating to marine and/or mining tenures and interests.						Yes	Yes			
2.3	The implications of Parts II, VII, VIII, IX and XI of the Public Works Act 1981 to land use and subdivision, and cadastral	Yes		Yes	Yes		Yes	Yes			
2.4	The implications of the Local Government Act 1974 & 2002 on land use and subdivision, including DIF's.			Yes	Yes		Yes	Yes			
2.5	The evolution of legislation controlling subdivision, land settlement and development, and understanding and applying current planning, resource management and resource allocation legislation.			Yes	Yes						
2.6	The application of Part I, II, III, VI and X of the RM Act 1991 to land use and subdivision and the implications and restrictions these parts of the Act impose on land subdivisions. In particular an understanding of the subdivision consent process, S223, S224 and S357.	Yes		Yes	Yes		Yes	Yes			

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<b>Item</b>	<b>Demonstrate an understanding of, or ability to:</b>										
2.7	The implication of the Land Transfer Act on titles, easements, rights of way, access lots, covenants and other encumbrances.	Yes		Yes	Yes						
2.8	The implications of the Unit Titles Act and an understanding of Principal and Accessory Units, common property, Body Corporate, staging of UT developments.	Yes		Yes	Yes						
<b>3 Land Tenure Systems</b>											
3.1	The origins of the control of land subdivisions, principles and administrative practices of land registration and land tenure and the operation of the different land tenure systems in New	Yes		Yes	Yes		Yes	Yes			
3.2	The different types of surveys - unit titles, cross leases, fee simple, Maori - and their purpose in relation to land tenure and subdivision of land.	Yes		Yes	Yes		Yes				
3.3	Determine the status of land and associated interests and rights.	Yes		Yes	Yes		Yes	Yes			
3.4	The concepts and practice of indefeasibility of title, real property rights, and legislation affecting interests and rights in land.	Yes		Yes	Yes		Yes	Yes			
3.5	The basis of customary and Maori land tenure systems.	Yes		Yes	Yes		Yes	Yes			
3.6	Limited titles and their impact.	Yes		Yes	Yes		Yes				
3.7	The Crown's responsibility for the operation of the tenure system.	Yes									
<b>4 Land Boundary Definition and Data Lodgement</b>											
4.1	The principles of boundary definition.	Yes									
4.2	Apply the Surveyor General's standards for Cadastral Surveying.	Yes									
4.3	Recognise, interpret and resolve anomalies in the cadastre.	Yes									
4.4	Interpret and apply all Acts, Regulations and Rules and case law and common law relating to cadastral surveying.	Yes									
4.5	Apply the different classes of survey, their purpose and accuracy tolerances.	Yes									
4.6	Locate old boundaries, interests, property rights, covenants and limitations on public, private and Maori land, including relevant physical, historical and legal evidence.	Yes	Yes				Yes				
4.7	Determine the position of new boundaries, including natural and obstructed boundaries, with respect to existing boundaries, interests and property rights.	Yes					Yes				
4.8	Determine the position of boundaries, interests and rights with reference to the vertical datum.	Yes					Yes	Yes			
4.9	Describe and determine boundaries of interests and property rights for marine licenses and other interests in the seabed.	Yes						Yes			
4.10	Describe and determine boundaries of interests in mineral rights.	Yes					Yes				
4.11	Interrogate all survey, title and land information records and databases and correctly interpret their data.	Yes	Yes		Yes		Yes	Yes			Yes
4.12	Digital cadastral survey datasets and reports from the digital cadastre.	Yes					Yes				
4.13	Mean High Water Springs and Coastal definition, irregular boundaries.	Yes						Yes			
4.14	Surveys for removal of Limitations from titles.	Yes									
4.15	Interpret and add information to cadastral records correctly including esurveys.	Yes									
4.16	Balance the interests of all current and future affected parties in relation to boundary definition and defining and describing interests in the land.	Yes									
<b>5 Information Systems</b>											

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<b>Item</b>	<b>Demonstrate an understanding of, or ability to:</b>										
5.1	The basic principles, concepts and methods for using digital spatial and attribute data for visual presentation.	Yes		Yes							Yes
5.2	Apply those basic principles, methods and concepts for using digital spatial and attribute data so as to merge and transfer data into and between other formats or systems.	Yes									Yes
5.3	The basic principles of geographic information systems management and operations, their development process, and the application of these concepts to intelligent spatial information systems.	Yes									Yes
5.4	Survey information technology, survey data sources and systems, and their analysis and interrogation, relevant to cadastral surveying and subdivision of land.	Yes									Yes
5.5	Access and retrieve information from data sources and systems and enhance them by presenting new and accurate data sets.	Yes									Yes
5.6	Landonline	Yes	Yes	Yes		Yes	Yes	Yes			Yes
<b>6 Resource Management Planning</b>											
6.1	Land planning principles and the relationship between form and function in land development.			Yes	Yes						
6.2	The concepts and principles of land value, and understanding valuation records.			Yes	Yes	Yes					
6.3	The relevance of district and regional plans to land use and subdivision and the ability to interpret the rules therein.	Yes		Yes	Yes	Yes					
6.4	The subdivision consent process.	Yes		Yes	Yes	Yes					
6.5	The land use consent process.			Yes	Yes	Yes					
6.6	The discharge consent/earthworks consent process.			Yes	Yes	Yes					
6.7	The objection and appeal process.			Yes	Yes	Yes					
6.8	The Environment Court and High Court and their roles in determining disputes arising from the RM Act.			Yes	Yes						
6.9	The principles regarding which matters should be addressed in making an application for resource consent.			Yes	Yes	Yes					
6.10	The principles relating to conditions of resource consent, and what makes a legal condition, including the use of Consent Notices, Covenants and Encumbrances.			Yes	Yes	Yes					
6.11	The principles of good urban design.			Yes	Yes						
6.12	The principle of sustainability and assessing both positive and negative effects.			Yes							
<b>7 Engineering Principles</b>											
7.1	The basic principles of soil properties, land stability, inundation, and soil compaction methods and control.	Yes		Yes							
7.2	The principles of allotment design, providing utilities and services to allotments, roading patterns and access in relation to topography and layout.	Yes		Yes							
7.3	How subdivisional design techniques apply to varying topography and layout.			Yes							
7.4	The engineering calculations for earthworks involving cut and fill design, soil volumes and batter slopes.		Yes	Yes		Yes					
7.5	Urban and rural roading design, including geometric standards, pavement design, selection of roading materials, road construction control and testing, and basic traffic engineering.		Yes	Yes							
7.6	Wastewater systems design, their construction, inspection and testing procedures.		Yes	Yes							

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<b>Item</b>	<b>Demonstrate an understanding of, or ability to:</b>										
7.7	Stormwater systems design of both piped and open channel systems, and the construction, inspection and testing		Yes	Yes							
7.8	The basic principles of the design of water supply systems for residential subdivisions, accounting for their requirements for safe public health, their suitability for fire fighting, and their construction, inspection and testing procedures.			Yes							
7.9	Describe how communications and energy services are provided to residential subdivisions.			Yes							
7.10	Engineering design to the extent necessary to identify where it may be incompatible with the topography or subdivision consent, existing rights and interests, or existing cadastral boundaries.	Yes		Yes							
7.11	Engineering design and to ensure all easements and other rights or restrictions can be correctly defined to ensure the proper servicing of the subdivision.	Yes		Yes							
7.12	Prepare a schedule of quantities for a contract for land development.			Yes							
7.13	Prepare contract documents, call tenders, compare tenders, make recommendations on acceptance, prepare and finalise contract for construction of subdivision works.			Yes							
7.14	Contract administration, certification.			Yes							
7.15	Economic viability of different engineering solutions.			Yes							
7.16	The principles and methods of project management.			Yes		Yes					
<b>8 Professional Practice</b>											
8.1	The purpose and structure of the NZ Institute of Surveyors Inc and Consulting Surveyors of NZ.		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
8.2	The code of ethics, relationships with other members and with other professions, limits of expertise and elements of service to public and clients.		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
8.3	Quality Assurance systems.		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
8.4	Job management - deliverables, cost, time, resources.		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
8.5	Business structures, including sole practitioners, partnerships, limited liability companies, and their relative merits and disadvantages.		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
8.6	Basic accounting, including profit and loss, balance sheets, budgets, bank accounts, loans, personal guarantees, annual returns.		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
8.7	Professional liability, professional indemnity insurance, public liability insurance, duty of care.		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
8.8	Employment law, PAYE, GST, FBT, RWT, hiring & firing.		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
8.9	Debtors/creditors, debt control, cashflow control, loan and		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
8.10	Building leasing and ownership, tenancy/leasee rights.		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
8.11	Marketing and business promotion as they affect professional practice.		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
8.12	The options for financing the acquisition of survey equipment, office equipment, vehicles - buy, lease, hire purchase.		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
8.13	Occupational safety and health - the law and practice.		Yes	Yes		Yes	Yes	Yes			
<b>9 Mining Surveying (The holder of a Certificate of Competency as a Mine Surveyor will be deemed to meet the Mine Surveyor competencies provided they have a recognised professional degree.)</b>											
9.1	Basic knowledge of geology.					Yes					

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		Cadastral Surveying	Non-cadastral Surveying	Land Development and Land Devlmt Engineering	RM Planning	Geodetic Surveying	Mining Surveying	Hydrographic Surveying	Photo- grammetry	Remote Sensing	GIS
Item	Demonstrate an understanding of, or ability to:										
9.2	Underground safety and risks associated with working underground.						Yes				
9.3	Undertake surveys and be able to quantify volumes in stockpiles.		Yes				Yes				
9.4	Produce Statutory Plans for Mine Inspectors and Regional						Yes				
9.5	Develop seam structure contours and ore thickness and surface cover isopach models.						Yes				
9.6	Compute ore reserve volumes, tonnages and recovery estimates.						Yes				
9.7	Carry out opencast progress and final as-built surveys including the associated computations of overburden and ore volumes.						Yes				
9.8	Design new underground roadways with dimensional, strata and grade criteria and have a knowledge of surface road design.						Yes				
10	<b>Hydrographic Surveying - achieve IHO/FIG standards of competence for hydrographic surveyors in the following subjects (note that the holder of a Category A qualification will be deemed to meet the Hydrographic competencies.)</b>										
10.1	Nautical Science.							Yes			
10.2	Bathymetry.							Yes			
10.3	Water levels and Flows.		Yes					Yes			
10.4	Positioning on the surface of a water body.							Yes			
10.5	Hydrographic data management.							Yes			
10.6	Environmental science.				Yes			Yes			
10.7	Marine Law and Law of the Sea, marine protocols.							Yes			
11	<b>Photogrammetry</b>										
11.1	The basic principles of conventional film-based imaging systems and the calibration of these systems including principles of optics, lens properties, aperture and shutter speed, Also the characteristics of digital imaging systems, as well as camera calibration methods.								Yes		
11.2	The geometry of aerial photography including scale issues in vertical and tilted photographs and the derivation of ground coordinates from vertical or tilted photographs.								Yes		
11.3	Measurements from aerial photographs and undertake basic reduction of these measurements. Includes an understanding of the coordinate system for image measurement, refinement of the measured image coordinates, stereoscopic parallax, and the computation of ground elevations from parallax.								Yes		
11.4	The techniques and instrumentation for, and able to make stereoscopic three-dimensional measurements from aerial photographs. Includes understanding how to undertake interior, relative and absolute orientations, as well as the basic design of optical streoplottting instruments, analytical stereoplottting instruments and digital workstations.								Yes		
11.5	The principles of digital orthophoto production as well as the characteristics of image maps. Production of digital orthophoto or orthoimage map.								Yes		
11.6	Planning a photogrammetric project, including the control requirements, image data acquisition, cost estimation and scheduling.								Yes		
12	<b>Remote Sensing</b>										

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		Cadastral Surveying	Non-cadastral Surveying	Land Development and Land Devlmt Engineering	RM Planning	Geodetic Surveying	Mining Surveying	Hydrographic Surveying	Photo- grammetry	Remote Sensing	GIS
Item	Demonstrate an understanding of, or ability to:										
12.1	Basic principles of electro-magnetic energy, radiation laws, propagation of EM energy, interaction of EM energy with matter, and the basics of radiometry.									Yes	
12.2	The principles used in designing remote sensing systems such as radiation sources, EM energy interaction with the atmosphere, EM energy interaction with earth targets, and the spectral properties of earth targets (optical, thermal and microwave)									Yes	
12.3	Familiar with remote sensing sensors and platform technologies, including ground, airborne and spaceborne imaging systems, digital and analogue aerial cameras, multispectral scanners, active and passive microwave systems, LiDAR systems, and sensor selection.									Yes	
12.4	Capable of undertaking image processing and image interpretation. Includes the use of digital computer and image processing systems, techniques of field data collection (GPS, sampling, spectroradiometry), image data preparation (georectification, data calibration, data fusion, radiometric preprocessing), image enhancement (filtering, spectral space, transformation, spectral indices), pattern recognition and image classification (Gaussian, textural, fuzzy classifiers, artificial neural network) and photo interpretation.									Yes	
12.5	Apply remote sensing techniques, including reporting and documenting results, to a specific discipline area such as geology, forestry, agriculture, land use, archaeology, water resources, oceanography, climatology, mineral and aggregate resources, urban planning, industrial development, transportation facilities, volcanic and earthquake surveys and investigations, and environmental and pollution surveys.									Yes	
<b>13 Geographic Information Systems</b>											
13.1	Different types of GIS, the different layer file formats, and the conversions that are required for using the data in different systems.										Yes
13.2	Different coordinate systems and projections and their role in using data in GIS.										Yes
13.3	Various methods of converting between datums, choice of the most appropriate datums, and how and when they should be										Yes
13.4	Data transfer standards.										Yes
13.5	Editing data in a GIS. Data maintenance (data cleansing, data aggregation).										Yes
13.6	The importance of maintaining topology when manipulating data.										Yes
13.7	Data relativity. Spatial accuracy.										Yes
13.8	Graphical representation of spatial entities (real world, schematic, generalisation, feature representation standards).										Yes
13.9	Geoprocessing procedures, data layer relationships and spatial interrogation.										Yes
13.10	The different geography of layer types (vector and raster analysis) and the difference between geography types (points, lines, polygons).										Yes
13.11	Analysis of data (buffering, shortest path, demographic, map production).										Yes
13.12	Use of national datasets (cadastral, topographical, hydrological, etc).										Yes
13.13	Database design and modelling. Data modelling and its implementation.										Yes

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Item	Demonstrate an understanding of, or ability to:										
13.14	Thematic representation of attribute information.										Yes
13.15	The primary differences between CAD and GIS.										Yes
13.16	Interchange of data between CAD and GIS.		Yes								Yes
13.17	Imagery (satellite, aerial photography, orthophotography).								Yes	Yes	Yes
13.18	Metadata										Yes
13.19	Management of temporal data.										Yes
<b>14 Geodetic Surveying</b>											
14.1	<b>Principles:</b> General principals of Geodetic Surveying, Geodesy, Astronomy and Cartography	Yes				Yes					
14.2	Geographical coordinates, Cartesian coordinates, Clarke's equations for computations on the ellipsoid, Ellipsoids used in NZ.					Yes					
14.3	<b>Reference Frames and Datums:</b> Understands national and international references frames including those used for astronomical purposes. The practicality and application of various types of geodetic datum - 1D, 2D, 3D and 4D (dynamic). Datums used in NZ, (e.g. Auckland MSL 1946, Old Cadastral, NZGD49, NZGD2000, ITRF 2000).	Yes				Yes					
14.4	The definition of the geoid, differences between ellipsoidal, orthometric and dynamic heights. Methods of geoid determination.		Yes			Yes		Yes	Yes	Yes	Yes
14.5	<b>Projections:</b> The mapping projections used in NZ including Meridional Circuit/Transverse Mercator projections and NZMG. The various other types of mapping projections used in other countries and internationally.	Yes	Yes			Yes					Yes
14.6	<b>Transformations:</b> Transform values between ellipsoidal coordinates and plane coordinates.					Yes					
14.7	<b>Datum Shifts:</b> Awareness of when a datum shift is required. The various types of datum-shift calculations (e.g. 3 parameter, 7 parameter [Bursa-Wolf or Molodensky], grid distortion model, etc); software applications for these computations.					Yes					
14.8	<b>Network Design:</b> Reconnaissance and site selection criteria, network pre-analysis. Geodetic Database searches. Independent observations and network redundancy.					Yes					
14.9	<b>Physical Maintenance:</b> Monumentation, beaconing, protection structures and associated maintenance requirements for a geodetic network.					Yes					
14.10	<b>Historic Equipment:</b> The types of geodetic equipment historically used and the typical accuracies attained, e.g. invar bands, theodolite observations (Wild T3 or T2) Tellurometer, EDM or laser distances, Shoran trilateration, Doppler satellite translocation, optical precise					Yes					
14.11	<b>Conventional Equipment:</b> Use accuracies and application of modern conventional equipment e.g. digital levels, lasers, total stations, etc in		Yes			Yes					
14.12	<b>GPS System</b> User, Satellite and Control Segments. GPS satellite signals, frequencies and observables.		Yes			Yes					

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Item	Demonstrate an understanding of, or ability to:										
14.13	<b>GPS Equipment:</b> Modes of operation and accuracies attainable (i.e. autonomous, differential, static/fast static, kinematic, RTK). Antenna types, multi-path mitigation, and understanding of antenna phase centre corrections.		Yes			Yes					
14.14	<b>GPS Field Procedures:</b> Campaign session planning. Height checks. Antenna orientation, tribrach checks etc.		Yes			Yes					
14.15	<b>Data Processing:</b> Data processing including processing static and fast static GPS baseline observations using a proprietary software package. Utilising RINEX format data from permanent tracking sites.					Yes					
14.16	<b>Network Adjustments:</b> General understanding of least squares principles. Constrained and freenet adjustments. Software using a least squares adjustment software package (preferably SNAP).					Yes					
14.17	<b>Network Analysis:</b> Statistical testing to show that a network of observations meets any relative or absolute accuracy requirements.					Yes					