

Appendix to Membership Policy

Competencies for S+SNZ Membership

November 05

Competency		Disciplines									
		(a) Spatial Measurement	(b) Cadastral Surveying	(c) Land Development Engineering	(d) Resource Management Planning & Design	(e) Geodetic Surveying	(f) Mining Surveying	(g) Hydro. Surveying	(h) Photo- grammetry	(i) Remote Sensing	(j) Geographic Information Systems
Note - Competencies in column (b) meet the CSLB requirements as at Oct 2005											
Item	Demonstrate an understanding of, or ability to:										
1	Spatial Measurement										
1.1	The theory and application of the principles of plane and topographic surveying in a variety of contexts.	Yes	Yes			Yes	Yes	Yes			
1.2	The broad principles of geodetic surveying, remote sensing and photogrammetry.	Yes	Yes			Yes	Yes	Yes	Yes	Yes	Yes
1.3	Properly use and calibrate survey equipment to ensure correct measurement and the minimisation of errors.	Yes	Yes			Yes	Yes	Yes			
1.4	Record and document measurements and other survey observations accurately.	Yes	Yes			Yes	Yes	Yes			
1.5	Apply both appropriate measuring equipment, methods and techniques to the discipline area (processing and eliminating material measurement errors), and methods of correcting and adjusting measurements.	Yes	Yes			Yes	Yes	Yes	Yes	Yes	
1.6	Apply statistical and mathematical analysis to measurements; to make appropriate geodetic and map projection corrections, corrections to GPS observations, and rectify terrestrial aerial photographs and images.	Yes	Yes			Yes	Yes	Yes	Yes	Yes	Yes
1.7	Undertake coordinate transformations in two and three dimensions and relate these to the reference systems used.	Yes	Yes			Yes	Yes	Yes	Yes	Yes	Yes
1.8	Interpret and determine topographic and hydrographic features.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
1.9	Undertake topographic surveys using appropriate methodologies.	Yes	Yes				Yes	Yes			
1.10	Complete an as-built survey of completed engineering works.	Yes					Yes	Yes			
1.11	Complete surveys to precisely set out buildings and construction works (horizontal and vertical).	Yes				Yes	Yes	Yes			
1.12	Leveling at second order or lower.	Yes	Yes			Yes	Yes	Yes			
1.13	GPS theory and practical use.	Yes	Yes			Yes	Yes	Yes			
1.14	BOMA surveys of buildings.	Yes									
1.15	Monitoring - horizontal and vertical.	Yes				Yes	Yes	Yes			
1.16	Height-to-boundary and certification thereof.	Yes	Yes								
1.17	Survey control for photogrammetric purposes.	Yes									
1.18	Use survey-specific software applications	Yes	Yes	Yes		Yes	Yes	Yes			
1.19	Three dimensional data capture using terrestrial laser scanners	Yes		Yes			Yes				
1.20	Determine azimuth from astronomical observations	Yes	Yes			Yes	Yes	Yes			
2	Cadastral Surveying (Land Law)										
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				
2.2	The legislation and administration processes relating to marine and/or mining tenures and interests.		Yes				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 surveying.		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				
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						

3.12	Prepare a schedule of quantities for a contract for land development.			Yes							
3.13	Prepare contract documents, call tenders, compare tenders, make recommendations on acceptance, prepare and finalise contract for construction of subdivision works.			Yes							
3.14	Contract administration, certification.			Yes							
3.15	Economic viability of different engineering solutions.			Yes							
3.16	The principles and methods of project management.			Yes		Yes	Yes				
4 Resource Management Planning and Design											
4.1	Land planning principles and the relationship between form and function in land development.			Yes	Yes						
4.2	The concepts and principles of land value, and understanding valuation records.				Yes		Yes				
4.3	The relevance of district and regional plans to land use and subdivision and the ability to interpret the rules therein.	Yes	Yes	Yes			Yes				
4.4	The subdivision consent process.	Yes	Yes	Yes			Yes				
4.5	The land use consent process.			Yes	Yes		Yes				
4.6	The discharge consent/earthworks consent process.			Yes	Yes		Yes				
4.7	The objection and appeal process.			Yes	Yes		Yes				
4.8	The Environment Court and High Court and their roles in determining disputes arising from the RM Act.			Yes							
4.9	The principles regarding which matters should be addressed in making an application for resource consent.				Yes		Yes				
4.10	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				
4.11	The principles and practice of good urban design.				Yes						
4.12	The principle of sustainability and the practice of assessing both positive and negative effects.			Yes	Yes						
5 Geodetic Surveying											
5.1	Understand the general principals of Geodetic Surveying, Geodesy, Astronomy and Cartography	Yes	Yes			Yes	Yes	Yes			
5.2	Ellipsoids, Geographical coordinates, Cartesian coordinates, Equations for computations on the ellipsoid, Ellipsoids used in NZ	Yes	Yes			Yes	Yes	Yes			
5.3	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		Yes			
5.4	The definition of the geoid, differences between ellipsoidal, orthometric and dynamic heights. Methods of geoid determination.	Yes	Yes			Yes	Yes	Yes	Yes	Yes	Yes
5.5	Understands and is able to use the mapping projections used in NZ including Meridional Circuit/Tranverse Mercator projections and NZMG. The various other types of mapping projections used in other countries and internationally.		Yes			Yes	Yes	Yes			Yes
5.6	Transform values between ellipsoidal coordinates and plane coordinates.	Yes	Yes			Yes	Yes	Yes			
5.7	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		Yes			
5.8	Reconnaissance and site selection criteria, network pre-analysis, Geodetic Database searches. Independent observations and network redundancy.					Yes					
5.9	Monumentation, beaconing, protection structures and associated maintenance requirements for a geodetic network.					Yes					
5.10	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 levels.	Yes				Yes	Yes	Yes			
5.11	Use accuracies and application of modern conventional equipment e.g. digital levels, lasers, total stations, etc in geodetic surveying.	Yes				Yes	Yes	Yes			
5.12	User, Satellite and Control Segments. GPS satellite signals, frequencies and observables.	Yes				Yes	Yes	Yes			
5.13	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					
5.14	Campaign session planning. Height checks. Antenna orientation, tribrach checks etc	Yes				Yes					
5.15	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					

5.16	Understands the principle of least squares and can apply the technique to a wide variety of problems including minimum constraint and frenet adjustments. Software using a least squares adjustment software package (preferably SNAP)	Yes				Yes					
5.17	Statistical testing to show that a network of observations meets any relative or absolute accuracy requirements.					Yes					
5.18	Undertake precise leveling					Yes					
5.19	Understands how to collect and reduce gravity measurements.					Yes					
6 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.)											
6.1	Basic knowledge of geology.					Yes					
6.2	Underground safety and risks associated with working underground.					Yes					
6.3	Undertake surveys and be able to quantify volumes in stockpiles.	Yes				Yes					
6.4	Produce Statutory Plans for Mine Inspectors and Regional Councils.					Yes					
6.5	Develop seam structure contours and ore thickness and surface cover isopach models.					Yes					
6.6	Compute ore reserve volumes, tonnages and recovery estimates.					Yes					
6.7	Carry out opencast progress and final as-built surveys including the associated computations of overburden and ore volumes.					Yes					
6.8	Design new underground roadways with dimensional, strata and grade criteria and have a knowledge of surface road design.					Yes					
6.9	Use gyrotheodolites and other underground surveying techniques.					Yes					
6.10	Place survey marks in positions free from disturbance.					Yes					
6.11	The effects particular of refraction in underground positioning and measurement					Yes					
7 Hydrographic Surveying - achieve IHO/FIG standards of competence for hydrographic surveyors in the following subjects (note that Level 1 Accredited Hydrographic Surveyors will be deemed to meet the Hydrographic competencies.)											
7.1	Nautical Science including rule of the road, aids to navigation, warnings, navigation publications, communication at sea, safety, ship behaviour, anchorage, pilotage, small boat use.						Yes				
7.2	Bathymetry, including acoustics, acoustic devices, and the use and calibration of transducers, sounders, side scan systems, and multibeam systems. Also includes other bathymetric measurement systems such as lead lines, lasers and remote sensing.						Yes				
7.3	Water levels and flows including tides, tide gauges, tidal analysis and prediction, tides models and currents.						Yes				
7.4	Positioning on the surface of a water body. Competencies are as indicated in Geodetic Surveying and Spatial Measurement. Also includes heave compensation, vessel orientation, and surveys for coastal zone management and offshore industrial developments.						Yes				
7.5	Hydrographic data management. Competencies required are as indicated under Geographic Information Systems but specifically include marine cartography and electronic charts.						Yes				
7.6	Environment Science, including meteorology, climatology, weather forecasting, ocean circulation, wind waves and swell, wave propagation, oceanographic measurements, geotechnical sampling and marine geology.						Yes				
7.7	Legal aspects of hydrographic surveying including the Law of the Sea, marine law, delimitation zones, contracts and product liability.						Yes				
8 Photogrammetry											
8.1	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			
8.2	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			
8.3	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			

