

GEOSPATIAL ENGINEERING COMPETENCIES – Land and Engineering Surveying

The measurement, definition and portrayal, either digitally or graphically in the form of maps or plans, of the physical features of, and the structures on the Earth's surface. The ability to understand engineering design information and from this provide dimensional control for all stages of construction work.

Range Indicators

Competency will be demonstrated in the application of relevant knowledge, understanding and skills set out in the land and engineering surveying competency requirements. Such knowledge and skills will normally be obtained through a structured education to the requisite level and work experience.

This area of specialism includes the following core skills:

- Comprehensive understanding of 2 & 3 dimensional co-ordinate geometry
- Comprehensive experience of all commonly used classes of instruments/tools that measure angles & distances
- Comprehensive experience of carrying out topographic surveys at various scales
- Comprehensive experience of engineering surveying/setting out at all stages of construction
- Understanding of principles of geodesy and the problems of representing curved surfaces with planar coordinates
- Comprehensive experience of the use of ICT for processing/manipulating geospatial information
- Experience of other aspects of measurement.

Communication, basic computing and health and safety skills apply to all specialisms and are elsewhere.

Evidence Guide

Evidence of successful achievement of this competency would be effective and efficient management of the land and engineering surveying process with the application of appropriate systems for monitoring and reporting of data, at the minimum levels as stated in the competency details and range of elements.

GEOSPATIAL ENGINEERING COMPETENCIES – Land and Engineering Surveying

	Competency	The ability to carry out TOPOGRAPHIC SURVEYS				
GES1	Optimum Standard	Activity Details	Date of Assessment			
			A	K	E	B
1	B	Specifications and scope of survey				
2	B	Understand and use of scale				
3	B	Site reconnaissance				
4	B	Use of appropriate coordinate reference system				
5	B	Use of appropriate survey control stations and measurements				
6	B	Height control – different methods of establishing				
7	B	A variety of methods of capturing topographic survey information. Radial obs, RTK GPS, tachymetry, tape/offset etc				
8	B	Use of appropriate equipment, total station, GPS, Tape, reflectorless EDM				
9	B	Data capture and feature coding. Recording of survey information				
10	B	Appropriate ongoing checking procedures				
11	k	Underground services surveys and record investigations.				
12	B	Data Processing, manual or using ICT				
13	E	Use and understanding of CAD, layering etc				
14	B	Presentation of information – digital, hard copy				

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	Competency	The ability to use, and understanding of, surveying instruments				
GES1	Optimum Standard	Activity Details	Date of Assessment			
			A	K	E	B
15	B	Total Stations – conventional				
16	B	Total Stations – reflectorless				
17	B	Other methods of measuring distance				
18	B	GPS - static - RTK				
19	E	Theodolites				
20	E	Levels – optical – precise				
21	B	Levels – optical – automatic				
22	K	Levels – optical – dumpy				
23	B	Levels – digital				
24	B	Levels – rotating laser				
25	B	Instrument checking				
26	B	Instrument calibration				
27	B	Instrument adjustment				
28	B	Accessories checking and adjustment				
29	A	Laser Scanners				
30	E	Electronic tapes/handheld measuring devices				

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	Competency	To be able to undertake engineering surveying / setting out and provide reports to clients and third parties				
GES1	Optimum Standard	Activity Details	Date of Assessment			
			A	K	E	B
31	B	Understanding requirements, accuracies				
32	B	Retrieving existing survey information and linking to design drawings				
33	B	Establishing and surveying appropriate control stations to appropriate accuracy				
34	B	Use of appropriate equipment, Total Station, GPS, Tape, reflectorless EDM				
35	B	Data capture, survey records				
36	B	Methods of marking dimensional information on site				
37	B	Communication of dimensional information to others. Verbal, graphical, written presentation of information				
38	B	Maintenance and verification of dimensional control				
39	E	Problems associated with curved surfaces				
40	K	The Earth – Spheroid, Geoid etc				
41	K	Projections				
42	K	National Reference grids				
43	E	Scale factor				
44	E	GPS data processing – general				
45	E	GPS – different reference frameworks, ETRS89, WGS84 or other				

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	Competency	To have knowledge and understanding of geometric principles				
GES1	Optimum Standard	Activity Details	Date of Assessment			
			A	K	E	B
46	B	3 dimensional co-ordinate geometry. All calculations, manual and using computers				
47	B	Geometric calculations				
48	B	2D and 3D Survey control – intersection, resection, free station, traverse, network				
49	B	Adjustment of survey measurements. Redundant observations, Principles of least squares, residuals, standard errors, error ellipses				
50	B	Quality of geometric configurations				
51	B	Measurement of heights – use of height datums- datum transformations				
52	B	Planar co-ordinate transformations				
53	B	Self-checking survey measurements				
54	E	Electronic data capture				
55	B	Transfer of survey data between instrument and computer				
56	B	Electronic processing of co-ordinate geometry data including geometric networks.				
57	E	Use and manipulation of digital round models				
58	E	Use of spreadsheets				

GEOSPATIAL ENGINEERING COMPETENCIES – Land and Engineering Surveying

	Competency	The ability to use ICT (Information and Communication technology) in surveying				
GES1	Optimum Standard	Activity Details	Date of Assessment			
			A	K	E	B
59	E	CAD - general principles, structure, layering				
60	K	CAD – various formats – autocad, MOSS, microstation and others				
61	E	CAD data transfer – dxf, Genio etc				
		A candidate should also show significant experience of at least two of the following specialist areas of measurement:				
62	E	Laser Scanning and processing of scanned data				
63	E	Measured surveys of buildings				
64	E	Monitoring of movement				
65	E	Control and measurement of verticality				
66	E	Remote Surveying				
67	E	Photogrammetry				
68	E	Underground services surveying				
69	E	Machine control instrumentation				
70	E	Hydrography				

	1 st Review	Supervisors signature	Date				
	2 nd Review	Supervisors signature	Date				
	3 rd Review	Supervisors signature	Date				