ISSMGE-TC306 - Geo-engineering Competencies.

What should Geo-professionals be able to do?

TC306 held an international conference in Galway, Ireland – Shaking the Foundations of Geo-engineering Education – in July 2012. Among other things the conference discussed the **content** of undergraduate and post-graduate education and training and the competencies of geo-professionals.

Instead of listing topics covered in courses, TC306 defines competencies in terms of what geo-professionals can **do** after stages of their education and training. These include the geo-engineering content of undergraduate and post-graduate and on-the-job training by employers. TC306 recognises the four job descriptions in the table depending on undergraduate degree and post-graduate degree and stage of training.

Degree and Experience	Job description	
Undergraduate degree	Graduate in civil engineering	Graduate in geology
5 years post-graduate work experience including a post-graduate degree	Geotechnical engineer	Engineering geologist

The following are the minimum competencies in **geo-engineerin**g expected by employers in the construction industry.

1 Graduate in civil engineering

1.1 Create spreadsheet calculations
1.2 Write a technical report
1.3 Describe soil and rock in engineering terms
1.4 By experiment determine the pore pressure in a sandcastle
1.5 Estimate ϕ' for sand and undrained strength of clay from soil descriptions
1.6 Draw a simple flownet; calculate flow rate and pore pressure at any point in the flownet
1.7 Calculate limiting undrained slope height and limiting drained slope angle
1.8 Calculate slope stability in jointed rock
1.9 Calculate stability of retaining walls
1.10 Calculate bearing capacity and settlement of simple shallow foundations
1.11 Calculate capacity of a single pile
1.12 Determine a compaction curve

2 Graduate in geology

2.1 Write a technical report
2.2 Design and manage a ground investigation
2.3 Describe soils and rocks in geological terms
2.4 Create a *geological* model including geological history and groundwater

3 Geotechnical engineer (everything in section 1 plus)

3.1 Do routine in situ and laboratory tests and interpret the results
3.2 Create a *geotechnical* model including design parameters
3,3 Perform and validate numerical analyses
3.4 Design simple foundations, slopes and walls
3.5 Design an embankment on soft ground
3.6 Design piled foundations
3.7 Design earthworks and pavements

4 Engineering geologist (everything in section 2 plus)

4.1 Describe soil and rock in engineering terms
4.2 Do in situ and laboratory tests and report the data
4.3 Supervise ground investigations and prepare borehole and test pit logs
4.4 Assess aggregate resources
4.5 Select appropriate geo-construction methods

A *geological* model contains a 3D representation of the ground expressed in geological terms including strata boundaries, folding, faulting and groundwater. A *geotechnical* model contains these and includes numerical values for strength, stiffness and permeability required for geotechnical analyses.