



The education and training of geotechnical specialists

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Geotechnics has developed into a specialist branch of civil engineering with many sub-specialists included within its ranks. This note argues for the need to provide geotechnical engineers with a broad training in the workplace to ensure that they experience and understand as many areas of work as possible. Geotechnical engineers need to appreciate the needs of the many inter-related disciplines to ensure that they are able to contribute positively to the design process and recognise the primary concerns when there is the inevitable need for compromise.

1. INTRODUCTION

John Atkinson¹ has discussed the education of ground engineers, and has mentioned some basic principles that should be taught, understood and ideally remembered. Education is usually broad, covering at least the range of the geotechnical specialist areas and probably more general engineering. This briefing argues that there is also a need to provide a broad training in the workplace to avoid the sole creation of specialists who lack an understanding of other specialisms.

2. GEOTECHNICAL SPECIALISTS

Geotechnical engineering has developed into a specialist field in its own right, with an increasing number of sub-specialists. Consider for example the design of a retaining wall.

- (a) A geologist may advise on the local geology.
- (b) Soil parameters are needed to model the soil: these may be provided by a geotechnical engineer who specialises in the interpretation of the site investigation and the laboratory testing of the soil.
- (c) The construction planner details the construction sequence.
- (d) The specialist contractor defines the type of retaining wall to suit his/her preferred installation method and his/her available equipment.
- (e) The retaining wall is analysed using a soil–structure interaction program, possibly a finite-element program run by an analyst—a specialist in numerical modelling.
- (f) The bending moments and shear forces generated by the analysis are sent to a structural engineer to confirm the size of the structural members and define the reinforcement details.

Of course, one person may carry out this whole process, but it

serves to demonstrate the potential involvement of many different specialists.

3. SPECIALIST CONTRACTORS

Many specialist contractors inevitably offer a limited range of products, because of the high level of investment necessary for the plant and experienced operators to offer the full range of methods. In our commercial world the specialist contractors may try to sell their available techniques, whether or not they are the most suitable for the project in question.

It is also a facet of human nature that the choice of method and technique is often not based on engineering logic, but may relate to the personal preference of the decision-maker. Main contractors who have had a successful project using a specific technique will naturally hold this technique in high regard for their next project.

4. GEOTECHNICAL DESIGN

Design requires the general knowledge to be able to overview the various elements. The problem is that a pure specialist is likely to find this difficult. We enjoy working comfortably within our field of knowledge, but we risk ending up contributing our bit without any interaction with others. A competent design has to be achieved by communication between the specialist fields involved to ensure the consistency of the parts that constitute the solution. Taking the example of the design of a retaining wall as discussed above, this should ensure that, for example

- (a) the geologist's assessment is relevant to the needs of the project
- (b) the soil parameters are suitable for the strain levels to be experienced by the soil
- (c) the planner's construction sequence is compatible with the preferred type of retaining wall
- (d) the installation method is suited to the site and the ground conditions
- (e) the cost and complexity of the analysis are matched to the project
- (f) the structural engineer's design is compatible with the foundation contractor's construction method.

A broad basic training is vital to ensure that the designer has an appreciation, at least, of as many fields as possible. This is not limited to the period of formal education but needs to

extend into training. The Institution of Civil Engineer's graduate training schemes² encourage this by means of the core objectives, which are designed to extend the graduate's experience beyond the immediate task.

Do we encourage the attainment of a broader experience during training? This often means losing key team members, who are transferred to work in other areas. This can be disruptive and expensive in terms of the training time. But it has to be endured to ensure that future engineers are not trained merely in a discrete specialism.

5. SPECIALISTS

The above arguments suggest that there is no place for pure specialists in geotechnics. I would not want to leave that impression. It is the dedication of the specialist that enables our understanding and technology to advance, providing solutions to enable us to improve the construction process and analysis techniques. With the ever-increasing wealth of knowledge and experience, no one can pretend to be the ultimate geotechnical

specialist today. We have to specialise in order to contribute to engineering design and hopefully to push forward the frontiers in some small way.

6. CONCLUSIONS

We need specialists in all fields to act as the focus of best practice and develop our profession further, but we must not become so focused on are particular skill that we become isolated from the others. We must be prepared to invest in the training of our younger engineers to give them a broad understanding of as many fields as possible.

REFERENCES

1. ATKINSON J. What is the matter with geotechnical engineering? *Proceedings of the Institution of Civil Engineers Geotechnical Engineering*, 2002, 155, No. 3, 155–158.
2. INSTITUTION OF CIVIL ENGINEERS. *Core Training Objectives*. Institution of Civil Engineers, London, ICE 2011/12.

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