

## GEOTECHNICAL ENGINEER

### BACKGROUND INFORMATION

The geotechnical engineer plays a key role in most civil engineering projects as most structures are built on or in the ground. Geotechnical engineers assess the properties and behaviour of soil and rock formations. Geotechnical engineering is a collective term for the more individual disciplines of:

- Soil mechanics
- Foundation engineering
- Engineering geology and hydrology
- Environmental science
- Rock mechanics
- Rock engineering
- Other related disciplines to civil engineering design and construction.

The geotechnical engineer may, for example, assess the materials to be used for the stability of dams, roads, channels, tunnels and airport runways. They may also be involved with the analysis and design of building, bridge, tower and ocean platform foundations, as well as with the extractive and ground-related environmental industries.

### REQUIREMENTS TO DO THE JOB

Geotechnical engineers generally require a bachelor degree in Engineering, Geology, Physics or Maths and an MSc/PhD in Soil Mechanics, Rock Mechanics, Geotechnical Engineering, Engineering Geology, Geophysics, Hydrogeology, or other ground related discipline. (A MSc/PhD is not compulsory but the majority of geotechnical engineers will have this additional training. Exceptionally, and increasingly rarely, some may not have any degree but will have many years experience.)

There are no minimum qualifications required to work as an Engineer in the UK. In order to work as a Chartered Engineer (CEng), an individual must have a relevant accredited Honours Degree in Engineering, plus two years' industrial training and further two three years of relevant experience with professional responsibility and corporate membership of a chartered engineering body (such as the Institute of Civil Engineers (ICE), the Institute of Structural Engineers etc.). They must then register with the Engineering Council (EC(UK)) after a final test of competence called the Professional Review.

Overseas nationals may be required to take the Part 2 examination of the EC (UK), or complete further industrial experience before they can register with the relevant Institution and the Engineering Council.

### REGISTRATION WITH A PROFESSIONAL BODY

Registration with a professional body is voluntary, though preferred by most employers.

Engineers wishing to use the titles: Chartered Engineer (CEng) or

Incorporated Engineer (IEng) must be registered with the appropriate Institute and the Engineering Council.

The Institute of Civil Engineers (ICE) has a number of agreements with overseas Engineering bodies that allow members to obtain Corporate Membership (CPR) without taking the Institution's Member Professional Review. Current agreements are in operation with the following organisations:

- Institution of Professional Engineers of New Zealand
- Hong Kong Institute of Engineers
- Institution of Engineers Singapore
- Institution of Engineers Australia

## **WORK PERMITS (UK) TREATMENT**

### **B&C**

The jobs of Chartered Engineer and Incorporated Engineer meet the skills criteria. Where a period of work base training is required to gain registration, approval should be given for the full length required on condition of obtaining registration. An adapted P70H should be used.

Other jobs will meet the skills criteria where the application and advertisement, where appropriate, state that the post requires at least three years experience at a minimum NVQ Level 3. Also, posts requiring a general HND level qualification or equivalent plus one year's engineering experience will meet the criteria. Posts requiring a HND in Engineering or equivalent will meet the criteria.

Many Ground Engineering posts are shortage occupations (See Annex A).

### **TWES**

TWES training applications can be approved when the OSN is undertaking work-based training towards membership of ICE (Institute of Civil Engineers) or another relevant body and the post is additional to the normal staffing requirements of the employer.

The post can fall for work experience when the position is additional to normal staffing requirements and the work experience is NVQ level 3 or above, due to the qualifications usually required for this job this would not normally be a reason for concern.

## **SALARY INFORMATION**

A new graduate can expect to start on between £19,500 and £23,000 a year. Experienced engineers earn between £24,000 and £37,000. Chartered engineers can earn around £49,000 year. Contractors generally pay more than Consultants.

## ADVERTISING

### **New Civil Engineer**

Michelle Pereira  
Tel: 0207 505 6808  
Fax: 0207 505 6798  
Email: [Michelle.Pereira@construct.emap.com](mailto:Michelle.Pereira@construct.emap.com)

### **Ground Engineering**

Olivia Horne  
Tel: 0207 505 6791  
Fax: 0207 505 6798  
Email: [Olivia.horne@construct.emap.com](mailto:Olivia.horne@construct.emap.com)

## FURTHER INFORMATION

### **British Geotechnical Association**

The Institution of Civil Engineers, 1 Great George Street, London SW1P 3AA.  
Tel: 0207 665 2233  
E-mail: [bga@britishgeotech.org.uk](mailto:bga@britishgeotech.org.uk)  
Website: [www.britishgeotech.org.uk](http://www.britishgeotech.org.uk)  
Contact: Gavin Bowyer

### **Association of Geotechnical & Geoenvironmental Specialists (AGS)**

Forum Court, 83 Copers Cope Road, Beckenham Road, BR3 1NR  
Tel: 020 8658 8212  
Fax: 020 8663 0949  
E-mail: [ags@ags.org.uk](mailto:ags@ags.org.uk)  
Website: [www.ags.org.uk](http://www.ags.org.uk)

### **The Engineering Council**

10 Maltravers Street, London, WC2R 3ER  
Tel: 0207 240 7891  
Fax: 0207 379 5586  
E-mail: [staff@engc.org.uk](mailto:staff@engc.org.uk)  
Website: [www.engc.org.uk](http://www.engc.org.uk)

### **Institute of Civil Engineers**

1 Great George Street, Westminster, London, SW1P 3AA  
Tel: 0207 222 7722  
Website: [www.ice.org.uk](http://www.ice.org.uk)

### **Engineering Group of the Geological Society**

The Geological Society, Burlington House, Piccadilly, London, W1J 0BG  
Tel: 0207 434 9944  
Fax: 0207 439 8975  
E-mail: [enquiries@geolsoc.org.uk](mailto:enquiries@geolsoc.org.uk)  
Website: [www.geolsoc.org.uk](http://www.geolsoc.org.uk)

**British Drilling Association**

Wayside, London End, Upper Boddington, Daventry, Northants, NN11 6DP  
United Kingdom  
Tel: 01327 264622  
Fax: 01327 264623  
E-mail: [office@britishdrillingassociation.co.uk](mailto:office@britishdrillingassociation.co.uk)  
Website: [www.britishdrillingassociation.co.uk](http://www.britishdrillingassociation.co.uk)

**Institute of Materials, Minerals, and Mining**

1 Carlton House Terrace, London, SW1Y 5DB  
Tel: 0207 451 7300  
Fax: 0207 839 1702  
Website: <http://www.iom3.org>

**Pipe Jacking Association**

10 Greycoat Place, London, SW1P 1SB  
Tel: 0845 070 5201  
Fax: 0845 070 5202  
E-mail: [andrew.marshall@pipejacking.org](mailto:andrew.marshall@pipejacking.org)  
Website: [www.pipejacking.org](http://www.pipejacking.org)

**British Tunnelling Society**

1 Great George Street, London, SW1P 3AA  
E-mail: [bts@britishtunnelling.org](mailto:bts@britishtunnelling.org)  
Website: [www.britishtunnelling.org](http://www.britishtunnelling.org)

**Federation of Piling Specialists**

Forum Court, 83 Copers Cope Road, Beckenham, Kent, BR3 1NR  
Tel: 0208 663 0947  
Fax: 0208 663 0949  
E-mail: [fps@fps.org.uk](mailto:fps@fps.org.uk)  
Website: [www.fps.org.uk](http://www.fps.org.uk)

**Chartered Institution of Water and Environmental Management**

15 John Street, London, WC1N 2EB  
Tel: 0207 831 3110  
Fax: 0207 405 4967  
E-mail: [admin@ciwem.org](mailto:admin@ciwem.org)  
Website: [www.ciwem.org](http://www.ciwem.org)

**Science Council**

210 Euston Road, London, NW1 2BE  
Tel: 020 7611 8754  
Fax: 020 7611 8743  
E-mail: [enquiries@sciencecouncil.org](mailto:enquiries@sciencecouncil.org)  
Website: [www.sciencecouncil.org/chartered\\_scientist](http://www.sciencecouncil.org/chartered_scientist)

## ANNEX A – SHORTAGE POSTS

The following Ground Engineering occupations were added to the shortage occupation list in July 2005. There is an overlap between occupations because of the type of work that is carried out in ground engineering:

**Geoenvironmental Engineer** - describes someone who deals with environmental aspects of the ground. Areas of work include:

- Regeneration to identify contamination and recommend, design and supervise appropriate treatment;
- Contamination studies that involve solid, liquid and hazardous waste including identification, disposal, treatment and reuse (note that some wastes are particulate materials like ground hence the experience of ground specialists in waste treatment);
- Development of geothermal energy systems;
- Landfill design.

**Geotechnical Engineer** - describes someone who deals with engineering the ground in the construction industry. Areas of work include:

- Design, supervision and interpretation of ground investigations;
- Design and supervision of construction of geotechnical structures including foundations, slopes, excavations, tunnels, and retaining walls;
- Monitoring the performance of geotechnical structures;
- Regenerating brownfield sites including identification of contamination and recommending, designing and supervising appropriate treatment;
- Contamination studies that involve solid, liquid and hazardous waste including identification, disposal, treatment and reuse;
- Development of geothermal energy systems;
- Coastal and river stability;
- Stability of mineral workings including underground and open cast mines;
- Investigation of subsidence and recommending and designing mitigation measures;
- Design of ground improvement schemes;
- Landfill design;
- Underground storage of hazardous materials including nuclear waste and carbon dioxide;
- Supervision of the construction of geotechnical structures including foundations, tunnels, and retaining walls.

**Geological Advisor** - describes someone who deals with geological aspects of the ground. Areas of work include:

- Mineral exploration and extraction;
- Coastal and river stability;
- Stability of mineral workings including underground and open cast mines;
- Design, supervision and interpretation of ground investigations;
- Investigations of subsidence.

**Geological Analyst** - a term used to describe a geoscientist who specialises in geological aspects (see Geoscientist below).

**Geological Associate** - a term that describes the status of an employee and their specialism (an associate is a recognised job title in those industries and usually refers to someone senior but below director level).

**Geological Engineer** - a term used to describe an engineering geologist (see Engineering Geologist below).

**Geologist / Hydrogeologist** - terms that describe anyone working in the field of geology or hydrogeology.

A geologist will be involved in:

- Design, supervision and interpretation of ground investigations;
- Mineral exploration and extraction;
- Coastal and river stability;
- Stability of mineral workings including underground and open cast mines;
- Underground storage of hazardous materials including nuclear waste and carbon dioxide;
- Investigation of subsidence.

A hydrogeologist deals with the flow of ground water and so investigates:

- Properties of the groundwater including its chemical properties and pattern of flow;
- Causes and effects of ground water pollution;
- Causes and effects of construction processes on the ground water;
- Effects of climate change on the pattern of ground water flow;
- Impact of changes to groundwater flow.

**Geology / Reservoir Engineer** - describes someone who specialises in geological aspects of reservoir engineering. "Reservoir" is taken to mean water reservoirs. There are other types of reservoirs that provide oil, water or store materials underground (e.g. nuclear waste). Duties include:

- Design, supervision and interpretation of ground investigations;
- Investigating the impact of changes to groundwater flow due to the construction of the reservoir;
- Studies of the geological structures in the vicinity of the reservoir leading to the appropriate location of the dam and the scope of the design of the foundation of the dam.

**Geomechanics Engineer** - is not a title that is commonly found in the UK but the nearest description is that of a Geotechnical Engineer (see Geotechnical Engineer above).

**Geophysical Specialist** - describes someone who specialises in the use of geophysics as an exploration tool. This is a remote sensing technique that actively or passively detects changes within the ground (e.g. variation in density, magnetism, and resistivity) which help characterise the ground. They

tend to work in mineral exploration (including oil, coal and building materials including sand, gravel and building stone; and precious metals); and ground investigation.

**Geophysicist** - a term used to describe a Geophysical Specialist (see Geophysical Specialist above).

**Geoscientist** - describes someone who is involved in analysing the chemical aspects of the ground. Areas of work include:

- Regeneration to identify contamination and recommending, designing and supervising appropriate treatment;
- Contamination studies that involve solid, liquid and hazardous waste that could contaminate the ground;
- Mineral exploration and extraction.

**Geosupport Engineer** - is not a title that is commonly found in the UK but the nearest description is that of either a Geotechnical Engineer (see Geotechnical Engineer above), Geological Engineer or Engineering Geologist (see Engineering Geologist below).

**Engineering Geologist** - describes someone who deals with engineering the ground who has specialist geological knowledge. Areas of work include:

- Design, supervision and interpretation of ground investigations;
- Design of geotechnical structures including slopes, excavations, tunnels, retaining walls;
- Regenerating brownfield sites including identification of contamination and recommending, designing and supervising appropriate treatment;
- Coastal and river stability;
- Stability of mineral workings including underground and open cast mines;
- Underground storage of hazardous materials including nuclear waste and carbon coastal and river stability;
- Stability of mineral workings including underground and open cast mines;
- Investigation of subsidence and recommending and designing mitigation measures.

**Ground Engineer** - is the generic title for anyone engineering the ground (i.e. all of these occupations that are involved in engineering)

**Contaminated Land Specialist** - describes someone who deals with environmental aspects of contaminated ground. Areas of work include:

- Regeneration to identify contamination and recommend, design and supervise appropriate treatment;
- Contamination studies that involve solid, liquid and hazardous waste including identification, disposal, treatment and reuse.

Caseworkers should check Knowledge Base for the latest shortage list and apply the Tier 1 criteria for occupations listed there.