CURRENT ISSUES RELATING TO THE PROFESSIONAL PRACTICE OF ENGINEERING GEOLOGY IN EUROPE.

EurGeol EurIng David Norbury
Secretary General, European Federation of Geologists, and
Associate Director, CL Associates, UK

(Contact david.norbury@mesg.co.uk)
KEYWORDS – Registration, competent person, codes of practice, standards, professional practice

ABSTRACT

The continuing internationalisation of the construction industry in which Engineering Geologists work has resulted in significant changes in the way we work, in the way we demonstrate to others our ability to do the work, and the environment in which we carry out our work. The pace of these changes is increasing and, shortly, few of us will be able to recall the relatively relaxed and informal ways in which we worked, even as recently as the beginning of the1990s.

The formalisation of engineering geologists' work and reporting has come about through increasing codification of technical activities, in description of soils and rocks, in field and laboratory testing. This codification has also seen the introduction of minimum qualifications for practitioners, and this links with moves towards the international recognition of professional qualifications. The Directives on recognition have been around for comment since about 2001, and are likely to appear in European Law towards the end of 2004. This then begs the question of the need for Registration, and whether such a step would offer sufficient advantages to be of overall benefit.

This paper seeks to outline some of these recent changes, suggest how they might affect professional practice, and to try to look forward to implications for the future.

INTRODUCTION

Over recent years there has been a major shift in attitudes towards more transparent professionalism, in particular in the areas of competence and responsibility. There is an increasing need for professionals delivering to the public (senso lato) to set, measure and demonstrate attainment of acceptable standards. Development of the necessary levels of competence and responsibility has been enshrined in national professional qualifications. The maintenance of these levels has been rather more informally attained through life long learning, generally termed CPD (Continuous or Continuing Professional Development). Increasingly there is also now a need to demonstrate that the required competence has been achieved and is being maintained. These trends are occurring at national level but are also appearing in proposals emanating from the European Parliament in Brussels.

Engineering Geologists belong to the profession of Ground Engineering that practices engineering with, on or in geological materials. Ground engineering is of considerable economic importance and benefits society in providing the means of efficient structures and sustainable use of resources and space. This is frequently not appreciated by the general public as most geo-engineered solutions are hidden in the ground. Nevertheless, ground-engineered structures are testament to substantial technological and intellectual achievements.

This fundamental input to the welfare and protection of society includes:

- the safety of residential, commercial and industrial structures,
- the essential supply of energy and mineral resources,
- the mitigation of geological hazards,
- the alleviation of human-induced hazards,

- the efficient functioning of the engineering infra-structure, and
- the contribution towards a sustainable environment.

Ground Engineering is based on the professional input of geologists and engineers, and specifically includes the scientific disciplines of engineering geology, soil mechanics, rock mechanics, hydrogeology and mining geomechanics. The execution of such projects requires the input of a range of scientific and engineering specialities, and these specialists have to be able to communicate between themselves in order to agree on theoretical models, and parameters within the models. In addition, and perhaps even more important is the need to communicate with other interested parties, not least the owner of the project.

Thus, the practice of Engineering Geology requires the communication of observations, test results and a ground model. This communication has to be unambiguous and clearly understood if the works are to proceed smoothly. In these days of engineering projects becoming increasingly international this clear communication also needs to take place between practitioners from different countries using a common international language. National codification of description terminology and field and laboratory test procedures has been appearing over the last thirty years, but the next step forward is for these national standards to be overridden by international standards. This process is reaching fruition in the first decade of the 21st century.

As with other professionals, Engineering Geologists need to demonstrate that they have obtained sufficient and suitable training and experience to act as competent professionals. The ultimate demand for such recognition is from clients and the society as a whole, but the recognition of such attainment levels comes from peer review within the profession. Peer reviewed titles have been available through national institutions in a number of countries for several years. Although the titles may be similar, it is not easy for others such as clients in one country to appreciate a qualification from another country. These practical difficulties limit mobility and international professional practice, and it has long been an aspiration to have some form of international qualification or professional passport. This concept is being brought forward by the European Parliament with the upcoming Directive on Mutual Recognition of Professional Qualifications. This Directive defines the Common Platform concept of professional competence, with the intention of achieving genuine mobility of professionals.

THE HISTORY OF CODIFICATION

Engineering Geology as a professional practice has been in existence for some 70 years, although others may argue that the practice has been around as long as man has been carrying out engineering works in and on the ground. In the early days the few practitioners readily communicated amongst themselves in terms of standard procedures and meanings of words and results, but this became increasingly difficult as the industry grew.

From the early days when there was no published guidance, there has been an increasing range of publications offering the opportunity for standardisation of practice in two distinct areas. Many of the procedures to be used in the field and in the laboratory became standardised, if informally at an early stage. Most such guidance has been prepared at a national level, but there has historically been limited co-ordination of these standards between countries. However, the description of soils and rocks, which is arguably the basis of all engineering geological studies and investigations, did not achieve the same early progress in this sense. Most guidance has been advisory rather than compulsory, possibly because geologists have tended to be independently minded practitioners.

As construction projects and engineering geology have become increasingly international, the need for common procedures and practices increases. Over the last 25 years so, in committee rooms around the world, work has been going on at an accelerating pace to prepare international standards. The Standards bodies responsible for co-ordinating and delivering this work are the Comité Européen de Normalisation (CEN) and the International Standards Organisation (ISO).

The intention by ISO and CEN in preparing international standards is to help raise levels of quality, safety, reliability, efficiency, compatibility and communication, and to provide these benefits at an economical cost. They contribute to making the development, manufacturing and supply of products and services more efficient, safer and cleaner. They make trade between countries easier and fairer and safeguard consumers, and users in general, of products and services.

WHY CODIFY ENGINEERING GEOLOGY?

The geologist has to collate and interpret the geological information and to compile a realistic geological model, and to include realistic assessments of the degree of uncertainty within the model. The key aspect of the Engineering Geologists' role then comes into play – the communication of all aspects of this model to other members of the design team and the project owner / client and, increasingly, the public.

This communication of information using normal geological nomenclature in a qualitative sense has often left listeners confused. As even standard geological nomenclature is usually qualitatively, rather than quantitatively, defined, even other geologists can be left uncertain as to the meaning intended. Over the years, a language of better defined terms has grown up which should enable the geologists better to communicate, not least because there is now a core of standard terminology with which the listeners will be familiar. It is the derivation and definition of this standard terminology which is one of the main reasons for recent advances in the drafting and implementation of codes in Engineering Geology.

The history of the development of codes in the practice of Engineering Geology is outlined here, largely by reference to publications in the United Kingdom, being the author's base of experience. This is not to ignore the many significant developments in other countries but, as the developments have been along similar lines at similar times, by way of illustration in one country. Examples of Standards from other countries are included in the References. Nationalist attitudes are now superseded, and we are in a profession where the guidance has become international and normative.

CODIFICATION OF DESCRIPTION

Before about 1970, there was no standard terminology allowing communication of descriptions of geological materials or their properties. This limitation was not too severe initially as the small number of practitioners were all known one to the other, and the early pace of life allowed and the embryonic nature of the science required much closer co-operation than is possible in these increasingly hectic times of international practice. Through the initial decades, most of the practitioner's efforts were directed at establishing systems of recording field data, storing samples, designing and building testing machines, and evaluating methods of foundation analysis. There was little time left to worry about preparing Codes of Practice.

Nevertheless, the first Code of Practice (CP 2001) was published in the UK in 1957. This Code laid down key underlying precepts for the description of soils in that soils should be described in accordance with their likely engineering behaviour but little in the way of defined terminology.

The use of undefined terminology caused confusion and ambiguity in communication and, as a result frequent contractual arguments and claims based on unexpected ground conditions. This can hardly be surprising as, if the terminology is variable and undefined, there will always be someone who could misread the ground conditions being predicted. For instance, terms such as highly fissured, or moderately jointed were not defined and therefore meant different things to different readers. This situation was untenable, and the nettle was grasped by the Engineering Group of the Geological Society of London who published, in the early 1970's, Working Party Reports on Core Logging and on Preparation of Maps and Plans (Anon 1970, 1972). These Reports formed the basis of UK practice and, as it turned out, international practice in many regards. Similar activities on the international scene resulted in a number of publications by 1981 on field investigation, geological mapping and soil and rock description, Anon (1977), IAEG (1981) and ISRM (1978). At the same time, in the UK this decade of guidance culminated in BS 5930 (1981), the seminal National Standard in site investigation and engineering geological activities. It is important to note however, that even at this stage this British Standard was designated as a Code of Practice, meaning that the guidance was advisory rather than normative (compulsory). This designation was maintained through to the update in BS 5930 (1999). However, the Codes are referenced in contract specification documents, and so become binding, and in legal arguments about claims or failures, the courts will expect the national guidance to have been followed. Therefore the practice, at least by default, is that the Codes of Practice are Standards.

Despite the codification in various countries proceeding separately, there has been a good deal of inclusion of practices from one country into that of another country. For this reason, the preparation of international codes has not been as difficult as might have been anticipated, at least as far as the description of soils and rocks is concerned (ISO 2003 a, b, c). However, the historic development of local codes has tended to reflect and emphasise local geological conditions, and the classifications were rather more difficult to bring together into an international standard. This proved particularly difficult in the classification of soils, and resulted in the need for a simple and separate ISO Standard on this topic (ISO 2003 b).

For example, the Scandinavian countries have different soils (coarse glacial deposits and quick clays) and Japan (volcanic soils, silts and sands liable to liquefaction) which, national practice has, for sound technical reasons, needed to incorporate (SGS, 1981; JGS, 2000). Other National Standards on the description and classification of soil include ASTM D2487(1993), D3282(1993), DIN 4022 (1987) and DIN 18196 (1988). Guidance on the description and classification of rocks for use in engineering applications include Anon (1995), ASTM D5878(19995) and D4879(1989).

CODIFICATION OF FIELD AND LABORATORY TESTING

Just as important as the codification of the primary communicator – the description – is the standardisation of field and laboratory procedures. This includes all aspects relating to forming the hole or exposure, the execution of field tests and the recovery of samples as well as the carrying out of laboratory tests. If the results of any of these activities are to be applicable and relevant in the minds of others, the procedures used need to be clearly identifiable and standard.

The codification of laboratory testing on soils was started at an early stage of the industry. By the late 1940' s, the early practitioners and young specialist companies were formulating procedures and practice from scratch. The procedures required included everything from how to drill a borehole, to the basic field tests, to the taking and description of samples, their storage and transport and laboratory testing. In fact, even the design of the testing machines needed to be evolved along with the test procedures. Methods of field investigation vary from country to country (influenced in part by geology) but, with the basic principles having become common over the years, standardisation is possible.

In laboratory testing, however, national practices became well advanced before the concept of formal international standardisation were recognised. As a result there are differences between countries. Although most of the differences are not great, the time taken to work all differences through in international committee would have delayed the achievement of the Eurocodes particularly as a change in test method now would require reconsideration of historically measured properties and correlations. The ISO and CEN work under way at the time of writing is therefore to prepare Technical Specifications which will not be normative.

The testing of rocks in commercial practice on the other hand started slightly later, by which time the potential need for international co-operation was better appreciated. In the meantime, national practices had not developed in the same way as for soils. It was therefore possible for the rock testing procedures to be better organised with the International Society of Rock Mechanics taking the lead by producing a series of Suggested Methods (ISRM, 1978). As there were no precedent procedures in place, these were rapidly taken up by the professional community and became internationally recognised without the involvement of national standards bodies. It would therefore be comparatively straightforward, but not necessarily easy, to prepare normative international standards for most rock tests.

CODIFICATION OF QUALIFICATIONS

A further aspect of codification that applies in any subject is the identification of qualifications and experience necessary for those who plan, execute and interpret ground investigations. The guidance documents and codes prepared up to the end of the 1980' s did not try to lay down rules on the qualifications and experience needed from those working as specialists in engineering geology. In the very early days, this was felt to be unnecessary, after all everybody knew everybody else and their capabilities and limitations. This has been increasingly not the case, and it is now necessary to define the roles and the allowable practitioners. It is interesting to consider who benefits most from such codification. Is it the client, who can feel better protected with proper professional advisors, is it the insurers who feel they have lower exposure, is it the individual practitioners who feel this improves their status in society, is it the employers who can recognise a qualified practitioner, or is it the companies who can see a market with fair competition? The truth is probably a bit of all of these. The position taken by the Standards institutions is based on the latter views, and Standards documents currently in preparation include definitions of specialist practitioners. These definitions will therefore become normative requirements in the practice of Ground Engineering.

THE FUTURE OF CODIFICATION

After 25 years in preparation, the suite of Eurocodes is, in late 2003, becoming a reality. These Eurocodes bring together codes of practice for building and civil engineering structures, and provide a world class standard for all aspects of construction. Included with Eurocode 7 : Geotechnical Design are elements of codes on the description and classification of soils and rocks, field investigation methods, field and laboratory testing, assessment of engineering parameters and design procedures. For the first time, engineering geologists throughout Europe will be talking a common language in reporting the findings of their work. The improvement of the position is even more widespread than Europe as, in accordance with the Vienna agreement, the standards drawn up by CEN and ISO undergo parallel voting procedures for common adoption. Thus, for example, the proposals for the description of soils and rocks, prepared by ISO (2003a, b, c), will be incorporated also into Eurocode 7. Thus, it will now be the case that Engineering Geologists around the world will be able to pass on their geological information, without misunderstanding and ambiguity. The brown sandy clay of the Japanese will be the same as the brown sandy clay of the Swedish geologist. Similarly, the results of field or laboratory testing will be transferable around the world. Major exceptions to this rule are China and the USA, who are not members of either of these Standards bodies, and who have had no input to the drafting of the Codes.

A Schedule of the Codes and Specifications being prepared by ISO and CEN in engineering geological investigation areas is given in Table 1. A Technical Committee of ISO prepared the Codes on the description and classification of soils and rocks. The reason this work item was proposed initially was, in accordance with the ISO mission, to encourage and allow international communication in applied science, and therefore to allow more and fairer competition for international trade. This enshrines therefore the concept of engineering geologists the world over all having a single reading of a ground model, and therefore competing for contracts and co-operating in design briefs on an equal footing.

<insert Table 1 about here>

The Eurocodes do not however, completely subsume national practices built up over the years. This is right and proper given that variations in engineering geological practice have a base in the different geological conditions in different countries. For instance the geological conditions in Scandinavia, with extensive shield rocks and quick clays, vary widely from the liquefaction prone sediments of the Pacific rim, and the deep weathering profiles of the tropics. These conditions require different approaches to investigation and testing. The description of the materials can however be based on a single standard approach.

The national differences in approach required can be incorporated into National Annexes, which allow key safety and technical issues to remain a national responsibility, and allow geological and climatic variations to be taken into account. However, these National Annexes are enhancements of, rather than local rewrites of, the overarching international codes.

THE PROFESSIONAL PROFILE OF A GEOLOGIST

Much of today's geological practice affects the health, safety and welfare of the public, the environment, and the economy and feasibility of engineered works. Mining, quarrying, construction, geotechnics, development of water resources, waste disposal and flood avoidance measures are just a few examples of activities that may significantly change the landscape and the quality of life of local inhabitants. It is essential in fulfilling these roles that the professional work of the geologist is always of the highest possible standard.

During the 19th and 20th century much of the world was explored, mapped, surveyed and its resources identified by geologists who qualified in European universities. Although this trend continues today, our industry is becoming increasingly international. Technical and financial assistance comes from a range of sources, training and research facilities are available in all countries, and consultants from across the world fly in to provide advice to clients and funders. In addition, many modern infrastructure projects traverse national boundaries, e.g. Channel Tunnel, Storabelt Link, Rhinebraun Coal and its dewatering effects.

This globalisation requires professionals of equal training, experience and status to meet and deal with the technical and professional issues on an equal footing. Thus, it essential that some form of international technical passport is recognised, that will allow practice in a range of jurisdictions.

Recent developments internationally within the natural resource and finance sector increasingly require that technical reports, particularly those reporting on a company's mineral resource assets, must be signed off by a "qualified person". The Canadian Securities Administrators specify (Toronto Stock Exchange, 1999, National Instrument 43, 2001) that a qualified person:

- must be a geologist or engineer;
- must be an individual, not a firm;
- must have at least five years of experience relevant to the particular project; and
- must belong to a self-regulatory organisation with disciplinary powers that is recognised by statute (a "professional association").

Similar requirements are insisted upon by the Australian Stock Exchange and by various government bodies responsible for the licensing and regulation of mineral exploration and development.

These institutions have published lists of professional titles that they recognise. In many jurisdictions the EurGeol and EurIng titles are so recognised, subject to the individual having the relevant experience. Certain national organisations are similarly recognised

The Reporting Code (2001) set new and specific definitions for Competent Persons, as follows.

DEFINITION OF A COMPETENT PERSON

A Competent Person is a corporate member of a recognised professional body relevant to the activity being undertaken, and with enforceable Rules of Conduct. A Competent Person should have a minimum of five years experience relevant to the style of mineralisation and type of deposit under consideration. If the Competent Person is estimating or supervising the estimation of Mineral Resources or Mineral Reserves, the relevant experience must be in the estimation, evaluation and assessment of Mineral Resources or Mineral Reserves respectively.

In addition to the normally understood academic training followed by professional and technical training, the experience required from the signatory to a report has to be in a field directly relevant to the report being signed off. The implication of this precedent is that all professionals signing off reports will have to examine their competence to do so. A reasonable test might be whether the signatory would feel comfortable justifying their competence to their peers or under cross examination by an aggressive lawyer.

Access to employment in another Member State is a fundamental aspect of the free movement of persons within the European Union. The European Union policy objectives are:

- increasing the community' s workers' chances of finding work and adding to their professional experience;

- encouraging the mobility of workers, as a way of stimulating the human resource response to the requirements of the employment market;

- developing contacts between workers throughout the member states as a way of promoting mutual understanding, creating a community social fabric and hence "an ever closer union among the peoples of europe,

Regrettably, this policy is still largely an aspiration. This was recognised by the Commission in the Veil Report (European Commission, 1996) which concluded that “free movement is not yet a daily reality for Europe' s citizens”, and noted that, in the case of the non-regulated professions, “the reality and size of the problem of the recognition of qualifications have been underestimated” (European Commission, 1997):

The profession of geology is regulated in only two countries within the European Union, namely Italy and Spain. Where Member States do regulate, each one does so by reference to the diplomas and other qualifications obtained in its national system of education and training. The situation in a selection of countries is summarised in Table 2. In Greece the situation is more serious as, although these problems do not arise, geological reports are only accepted by the statutory authorities when engineers sign them. It is difficult to reconcile this requirement with the Competent Person concept outlined above.

<insert Table 2 about here>

In an attempt to overcome, or at least to minimise, these problems the European Commission has encouraged national professional organisations to co-operate at the European level (European Directives 89/48/EEC and 92/51/EEC). For example, the Commission has welcomed the contribution that Common platforms and initiatives taken by the private sector can make to genuine mobility of professionals. It has also been noted that such initiatives might be particularly valuable in the field of non-regulated professions, which includes both geology and engineering.

THE EUROPEAN PROFESSIONAL TITLES IN PRACTICE

The development of defined professional roles is closely linked with development of Directives in the European Union. In order to facilitate mobility of workers, the availability of internationally recognised qualifications is essential. The Directive on this subject is being amended in 2003 and will probably be enacted within a year or two thereafter. The position for practitioners to be able to practice, at least for limited periods, in any EU country, is the holding of a recognised qualification. This qualification is likely to be the Common Platform of the European Federation titles of European Engineer (EurIng) awarded by the European Federation of Engineers (FEANI) and European Geologist (EurGeol) awarded by the European Federation of Geologist (EFG). These titles show that the bearer has undertaken appropriate tertiary level study, carried out appropriate training and gained sufficient experience, all over a combined minimum total of eight years, to be able to act as a professional engineer or geologist, and that this record has been submitted to his or her peers for validation. The holder of such a title agrees to work within the Code of Conduct operated by the awarding Federation and will be able to work in any European country, at least for limited periods, without the need to qualify separately in that country. These are major developments in providing commonality of professional standards, and represent development exactly as hoped for by ISO and CEN, but driven forward by the European Commission.

The European Commission recognises the value of such titles in facilitating the free movement of geologists within the Community. To guarantee wider international recognition the Federations have entered into reciprocal recognition agreements with kindred professional associations outside Europe.

The titles of EurIng and EurGeol currently have no legal status and confer no rights to work in any country. However, it is increasingly clear that possession of the title will speed the Engineering Geologist' s application to work outside their home base. The national member geological associations of the European Federations have agreed that any professional holding the title will be automatically given the same rights and privileges as a national geologist, up to the legal and competency limits that each National Association might have. In those cases where the National Association is the office in charge of the recognition of foreign titles, the recognition will be automatic. In those where its role is assisting a statutory registration authority, its recommendation will be favourable to the recognition, mentioning explicitly that the applicant bears the title of European Geologist.

The EU Directive on Recognition of Professional Qualifications is likely to be implemented shortly. The European Federations are already preparing to apply for recognition as the Competent Authority and for their awarded titles to be accepted within as the Common Platform within the Competent Person concept.

It is for these reasons that a Joint European Working Group on the professional competencies of engineering geologists and geotechnical engineers was formally established in 2002 by the Presidents of the ISRM, ISSMGE and the IAEG. Over recent years, and across several European countries, there has been an ongoing debate on the particular contribution and responsibilities of engineering geologists and geotechnical engineers in solving problems in ground engineering. The interactive elements of this debate are the triangles of engineering geology, geotechnical engineering proposed by Knill (2002) and the triangle of geomechanics. This need is also underlined by differing professional definitions and accreditation rules that exist for geologists and engineers within different European countries, and by the growing demand for geologically and technically sustainable, cost effective and safe geo-engineering solutions. Internally, the Joint Working Group is seen as a means of strengthening the co-operation across the three international societies and to identify common ground. The output from the Working Group and related discussions are covered by other papers in the opening session of this conference.

REGISTRATION

There is still uncertainty as to what Registration, or Licensing, is, and what it might mean to professional practitioners. Not least of the uncertainties is whether it is the professional practice that should be regulated, or whether it is simply another form of protectionism towards the title Engineer or Geologist. One of the most common justifications in favour of registration is on the basis of enhancement of status. This appears spurious, as status comes from performance, not from imposition of title, and probably reflects the long term downward trend in numbers of engineering graduates in the industry, and moving towards chartered status. Licensing exists in various forms (for example Canada, USA and parts of Australia), but there is little evidence that this introduces any financial benefits to the professions.

A recent meeting considered the difference between statutory title and voluntary regulation (Davies, 2003). As most governments are anti-regulation, legislators are unlikely to be persuaded of the benefits of statutory imposition, unless on grounds of public safety, value for public money or national wealth. Imposition will certainly not be introduced just to possibly enhance the salaries of practitioners.

The current arrangement of self policing, by competent nominated authorities (such as the EFG or FEANI) provides little or no regulation. Members are required to practice in accordance with the Code of Ethics, but this will only be challenged when a complaint is made or in the courts. The European Federation of Geologists has put in place a system of mandatory CPD, with the records of individual members being audited on a regular basis (annual or triennial). A higher level of regulation, on the other hand, would require a bureaucracy to police the industry, and individuals would have to provide any required self-justification to that policing body. One logical suggestion is that this could be the existing professional Federations, but there is a view in government circles that this should be removed from self control and transferred to civil servants. Although this would remove the direct cost from the institutions (but not from the individual members), most professionals would view this possibility with some alarm. In fact, the cost implications mean that this scenario is unlikely to arrive. This leaves the current institutions with the need to consider how they might operate Registration if the need arises.

The potential impact of Regulation on the industry could be very substantial, but it is less certain that it would benefit the industry. The key questions to ask include who should pay for Registration, and by whom and how would it be operated? In the UK the Science and Engineering Councils currently control the professions of geology and engineering respectively, providing umbrella control above the national title awarding bodies. The level of Regulation remains low however, and the focus of specialisation is broad. To increase the level of regulation would probably require narrower focus, and there is therefore a possibility of geology and engineering becoming rather more fragmented across the disciplines than is currently the case.

At present, an individual will carry the title Chartered / Professional / European Geologist or Engineer as appropriate, and would be required to operate within his or her competence as discussed above. One possibility would be for there to be a proliferation of titles such as Chartered Geophysicist, European Hydrogeologist and so on. There are those who might favour such moves, but the secretariat necessary to manage this will be expensive. The most important point however is the dilution of the impact and importance of the current titles. We can sell the competence and relevance of geology or engineering to the public without having to explain the subtle difference between different types of practitioners. The experience of other professions can readily illustrate the right approach. For instance barristers' rights of audience cover every practice area, but for an admiralty lawyer to appear in a murder prosecution could be breaching the code of ethics, and therefore this would not happen. There is absolutely no reason why ground engineers could not similarly be relied upon to work within their competence, so that each specialist would restrict themselves to the areas in which they demonstrably have the requisite experience.

Recent correspondence on the subject in the UK has tended towards the greater use of titles to show the public that they are dealing with a competent professional. Thus, all work would need to be signed off as suitable in terms of the core design and safety requirements by a titled Engineer or Geologist. These professionals would need to meet the requirements of a Competent Person. This is similar to the requirements that already exist in the UK for dams and nuclear structures, so this could be readily extended to encompass the signing off of ground engineering aspects of projects. It is not clear why this is not routinely required already. This also comes close to the requirements of those countries, such as Italy and Spain, in which the industry is currently regulated.

CONCLUDING REMARKS

Over a remarkably short span, engineering geology has gone from the early professionals who managed without codes, to today' s world where we are being increasingly controlled by codes. The codes coming into place in the 2000' s define how we drill holes, take and test samples, describe soils and rocks. Perhaps the biggest change however is reserved for the fact that we will have to carry internationally recognised qualifications if we want to be able to practice wherever we want, and that this will be possible.

ACKNOWLEDGEMENTS

I would like to thank the many people with whom I have held discussions with, sat in meetings with and generally evolved the ideas presented in this paper. In particular, I would identify fellow members of the EFG Board, John Clifford particularly, and Helmut Bock and Rodney Chartres from the Joint Working Group. The ideas presented in this paper are mine, and do not necessarily represent the views of either the EFG or my employer, both of whom I thank for permission to publish this paper.

REFERENCES

Anon (1970). The logging of rock cores for engineering purposes. Geological Society Engineering Group Working Party Report of the Engineering Group of the Geological Society of London. *Quarterly Journal of Engineering Geology,* **3**(1), 1-25

Anon (1972). The preparation of Maps and Plans in terms of Engineering Geology. Working Party Report of the Engineering Group of the Geological Society of London. *Quarterly Journal of Engineering Geology,* **5**, 297-367.

Anon (1977) The description of rock masses for engineering purposes. Working party report of the Engineering Group of the Geological Society of London. *Quarterly Journal of Engineering Geology,* 1977, **10**, 355-388.

Anon (1995). Description and classification of weathered rocks for engineering purposes. Working Party Report of the Engineering Group of the Geological Society of London *Quarterly Journal of Engineering Geology*, **28**(3), 207-242.

ASTM : D2487-93 (1993). Classification of Soils for Engineering Purposes (Unified Soil Classification System). ASTM, PA, USA

ASTM : D3282-93 (1993). Standard Classifications of soils and soil aggregate mixtures for highway construction purposes. ASTM, PA, USA

ASTM : D5878-95 (1995). Standard Guide ofr using Rock Mass Classification Systems for Civil Engineering Purposes. ASTM, PA, USA

ASTM : D 4879-89 (1989). Standard Guide for Geotechnical Mapping of Large Underground Openings in Rock.

BS CP 2001 (1957) Site Investigation. BSI, London

BS 5930 (1981) Code of Practice for Site Investigations. BSI, London

BS 5930 (1999) Code of Practice for Site Investigations. BSI, London

Davies, Sir David (2003) Note summarising Discussion on Engineering Registration. Engineering and Technology Board. June 2003

DIN 4022 (1987) Classification and Description of soil and rock. DIN 4022, Part 1

DIN 18196 (1988). Soil Classification for civil engineering purposes. Deutsche Norm.

European Commission (1997): Report of High Level Panel on Free Movement of Persons, Chaired by Mrs. Simone Veil, presented to the Commission on 18 March 1997

European Commission Press Release (1997): Free movement of people: Commission outlines follow-up measures to High Level Panel report

European Directive 89/48/EEC (1989): publ OJ L 9.24.1.1989, p.16

European Directive 92/51/EEC (1992): publ OJ L 209.24.7.1992, p.25

IAEG (1981) Rock and soil description and Classification for Engineering Geological Mapping. Report by IAEG Commission on Engineering Geological Mapping. *Bulletin IAEG Vol 24, pp 235 - 274*

ISO (2003a). Geotechnical Engineering – Identification and classification of soil – Part 1 Identification and Description. *EN 14688 – 1. ISO/TC 182/SC 1.*

ISO (2003b). Geotechnical Engineering – Identification and classification of soil – Part 2 Classification. *EN 14688 – 2. ISO/TC 182/SC 1.*

ISO (2003c). Geotechnical Engineering – Identification and classification of rock. *EN 14689. ISO/TC 182/SC 1.*

ISRM (1978). Rock Characterisation, Testing and Monitoring. ISRM Suggested Methods Editor E T Brown. Pergamon Press, Oxford.

JGS (2000). Method of classification of geomaterials for engineering purposes. Japanese Geotechnical Society 0051-2000

Knill, Sir John (2002). Core Values: The First Hans Cloos Lecture. – Proceed. 9th Congress, IAEG, Durban, 16 – 20 Sep. 2002.

National Instrument 43-101 (2001): Canadian Securities Administrators

The Reporting Code (2001): The Code for the Reporting of Mineral Exploration Results, Mineral Resources and Minerals Reserves. Publ. by European Federation of Geologists, Institution of Mining and Metallurgy, Institute of Geologists of Ireland, and The Geological Society of London.

SGS, Swedish Geotechnical Society (1981) Soil Classification and Identification D8:81. Laboratory Committee of Swedish Geotechnical Society. SGF Laboratory Manual, Part 2. Byggforskringsrådet.

Toronto Stock Exchange (1999): Setting New Standards – Final Report by the Mining Standards Task Force.

TABLE 1

Codes in preparation by CEN/TC 341 and ISO/TC 182/SC 1 on Geotechnical investigation and testing

ISO Reference Number	Title	Publication as EN / ISO standard
14688-1	Identification of soil	2002-06
14688-2	Classification of soil	2002-12
14689	Identification of rock	2002-12
22475-1	Sampling methods	2006-06
22475-2	Sampling – Qualification criteria	2006-06
22476-1	Cone Penetration tests	2006-06
22476-2	Dynamic Probing	2004-12
22476-3	Standard Penetration test	2004-12
22476-4	Menard Pressuremeter test	2006-06
22476-5	Flexible Dilatometer test	2006-06
22476-6	Self-boring Pressuremeter test	2006-06
22476-7	Borehole Jack test	2006-06
22476-8	Full Displacement Pressuremeter	2006-06
22476-9	Field Vane test	2006-06
22476-10	Weight Sounding test	2002-12
22476-11	Flat Dilatometer test	2002-12
22477-1	Testing of piles	2006-06
22477-2	Testing of anchorages	2006-06
22477-3	Testing of shallow foundations	2006-06
22477-4	Testing of nailing	2006-06
22477-5	Testing of reinforced fill	2006-06
17892-1	Water Content	2003-06
17892-2	Density of fine grained soils	2003-06
17892-3	Density of solid particles	2003-06
17892-4	Particle Size distribution	2003-06
17892-5	Oedometer test	2003-06
17892-6	Fall Cone test	2003-06
17892-7	Compression test	2003-06
17892-8	Unconsolidated Triaxial test	2003-06
17892-9	Consolidated Triaxial test	2003-06
17892-10	Direct Shear test	2003-06
17892-11	Permeability test	2003-06
17892-12	Atterberg Limits	2003-06

Table 2 Summary of the regulatory position in a selection of European countries.

Italy	• each region has its own Order of Geologists who administer the system • geologists must be a member of the Order to legally practice • foreign academic qualifications have no legal validity	It is virtually impossible for qualified professional geologists from other EU States to practice in Italy
Spain	• there are two systems for a EU citizen to legally practice • one is to obtain recognition of academic title by the Ministry of Education, Culture and Sports • second is governed by the terms of the free movement directive and operated by the Ministry of Science and Technology	On receipt of official authorisation, the Official Association of Spanish Geologists (ICOG), registers all geologists. In order to practise the professional must register in the association. Persons holding the EurGeol title are recognised by ICOG as national geologists
United Kingdom	• the regulated title "Chartered Geologist" is conferred by The Geological Society of London • application for this title can be made from a migrant who is a national of a Member State	Market forces reign, and no qualifications are required to practice
Ireland	• A "qualified person" has a recognised geoscience degree • at least 5 years experience in the relevant field, and • is a member of a relevant recognised "professional association" that admits members on the basis of academic qualifications and experience, requires compliance with professional codes of ethics, and has disciplinary powers	Reports submitted to government under the requirements of the Mining Act and to the Environmental Protection Agency will only be accepted if signed off by a suitably "qualified person".
Other	• market forces govern the situation • anybody can call himself a geologist and practice as such without professional qualifications • Where qualified employment is involved however, non-nationals may come up against the problem of the *de facto* recognition of their qualifications and diplomas	Problems have arisen in Belgium, Germany and Denmark where qualifications from other countries have not been recognised for minor reasons, and with no allowance being made for professional experience