SITE INVESTIGATION PRACTICE:

Assessing BS 5930

edited by

A. B. Hawkins
Department of Geology, University of Bristol,
Wills Memorial Building, Queen's Road,
Bristol BS8 1RJ

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Finally, the Group would also like to extend sincere thanks to everyone involved in the hosting of the meeting at the University of Surrey, and to Sir Monty Finniston our guest speaker at the Conference Dinner.

Preface

Since the time of the earliest structured buildings man will have been concerned about the nature of the ground on which he placed his structure. He may not have thought of his consideration as being a site investigation, and indeed it may have been little more than a walkover survey or a hand-dug trial pit. However, what man probably did in those days was use common sense and past experience in his assessment, rather than book-learned knowledge.

Little is known about the consideration of ground conditions prior to the construction of some of our largest buildings—the cathedrals. The location of some of these is surprising. Why, for instance, in 1220 was it decided to place Salisbury Cathedral, with its 404 ft (123 m) spire, on alluvial gravels rather than on solid rock?

Since the 1940s there has been an upsurge in the use of analytical techniques, resulting in the development of soil and rock mechanics as specialist disciplines. However, as Terzaghi and Peck state in the preface to the first edition of their famous book—Soil Mechanics in Engineering Practice—accurate solutions using these methods "... can be obtained only if the soil strata are practically homogeneous and continuous in horizontal direction." Further "... On the overwhelming majority of jobs no more than an approximate forecast is needed, and if such a forecast cannot be made by simple means it cannot be made at all."

Too frequently, in the initial stage of many investigations personnel with little experience are involved and some-one with an extensive background knowledge is called in only when the job goes wrong. There is much to be argued, however, that if site assessment is not undertaken by an extremely experienced person, it should at least be discussed with or checked by some-one with the background not only to anticipate most of the problems and forecast the likely consequences, but also to be able to advise on the most appropriate method of investigation. Whilst every encouragement should be given to the young, when undertaking a desk study the proverb "you can't put an old head on young shoulders" is extremely appropriate. Indeed, some would go even further and say that because of his particular training the initial site assessment is better made by a good, experienced engineering geologist than by some-one of equivalent standing in soil mechanics. It is interesting to see the remarks made by Robert Legget, the first William Smith Medallist, in the preface to his book—Handbook of Geology in Civil Engineering: "Geology, therefore, is the essential starting point of all site studies, as it must be for all geotechnical work. It is, correspondingly, the starting point for all foundation design, as it must be also for all overall site planning, whether the area is to be occupied by a small structure or by an entire town or industrial park."

Ideally of course, what is needed is individuals and communication. Subject boundaries are incidental providing, with whatever background we have, we know our limitations. Compared with the mathematically trained soil mechanician the engineering geologist has one major advance in that he will bring to his consideration of the ground and parameters an intuitive approach based on his earth science background, even though he may not actually undertake the calculations to support his "gut feeling". On the other hand, the soil mechanician, in his desire to apply ever more sophisticated analytical techniques, may find the actual ground conditions an inconvenience to his modelling, and be tempted to ignore vital evidence. It is of note that even in the 1980s, despite advice being available on the distinctly heterogeneous geology, the water tightness in a reservoir study was analysed on a computer, ignoring the layered nature of the geology because "it did not fit" any model. Each discipline has its own contribution to make; the best site investigations are without doubt those in which there is free interchange between specialists, each respecting the other's expertise.

Legget also reminds us that too detailed a mathematical study tends to obscure the fact that it is only by the observation of natural features in the field against a background of accumulated knowledge and hence steadily growing experience that the geology of a building site can first be studied and then can be kept under constant review until all ground works are complete. Whilst a quantitative assessment of any site is an essential element in a soil/rock mechanics study, its effective usefulness depends on the assumptions made of the soil/rock properties and the relevance of the laboratory/in situ test values to the actual field situation. Too often we test the samples and make our generalisations, rather than first making our generalisations and then deciding which samples to test in order to confirm our hypothesis and ensure the actual ground conditions are represented by the tests.

No computer will ever replace the judgement of the

geotechnical engineer in assessing soil/rock parameters for the stability of slopes or the suitability of foundations when the excavation is complete. As commented by Legget "Advanced calculations will assist, but, in the final analysis, it is on the spot judgement that must lead to immediate decisions, judgement which comes from long experience based on acute observation. For some, this experience will have been won in the field, their knowledge of geology being almost intuitive; for others, preliminary training in geology will have been sharpened and refined by experience in the field." Superstructures may often be the same, yet the changing geology even within a short distance means that a site investigation may indicate a different foundation method. For this reason all engineers should be conscious of the ultimate dependence of their structure on the ground and ensure their design has taken adequate account of the actual ground conditions.

Following the work of Terzaghi in the 1920s and 1930s major steps were taken in the development of soil mechanics in the 1940s. Not least of these was the setting up of Soil Mechanics Ltd in 1943—followed by other contracting firms—the publication of Geotechnique in 1948 and the production (1949) of the first draft Civil Engineering Code of Practice for Site Investigations. This document was then revised and published as British Standard Code of Practice on Site Investigations, CP 2001 (1957). CP 2001 was very geological in its approach and was used extensively, reminding some of Terzaghi's comments: "Unfortunately soils are made by nature not by man, and the products of nature are always complex." The 1957 Code undoubtedly stimulated the geological world and may well have contributed to the decision to form the Engineering Group of the Geological Society in 1964.

One valuable outcome of the formation of the Engineering Group and the publication of the Quarterly Journal of Engineering Geology (1968) was the advance made in the manner of recording rock, and in parts, soil data. The working party reports of 1970 and 1972 were important milestones and indeed formed the basis of part of the revised British Standard on Site Investigations published in draft form in 1976. This new document was such an advance on the 1957 Code that many contracts were specified on the Draft. It is unfortunate, however, that the final document was published without due consideration of some of the comments made on the Draft, and without claryifying some very pertinent questions. As with so many documents, BS 5930: 1981 required a second draft and now suffers from insufficient modification to make the document "what it should have been".

It was very timely therefore that the Engineering Group decided to use its 1984 Regional Meeting at the University of Surrey to assess site investigation practice. With such an important topic it was decided to change the established format and produce pre-published papers (Volume I). At the Conference itself, lead speakers introduced a selection of topics which were followed by house discussion. These actual Conference Proceedings were published as Volume II. The papers published in Volume I are placed in alphabetical order in this publication, rather than being assigned to lead-speaker topics. Prior to these, however, the lead-speaker papers and submitted discussions generated by them are published in the order they were given at the Conference.

As Chairman of the Engineering Group at the time of the Conference and Editor of the Proceedings, I am conscious that they are neither exclusive nor exhaustive. This is not the right time or place to elaborate on the individual pros and cons of either BS 5930: 1981 or the Conference, but I very much hope that this publication by the Geological Society as the second in their Engineering Geology Special Report Series, will stimulate further interest in this very important topic and aid the work of any revision committee.

A. B. Hawkins
Chairman of the Engineering Group
1982–1984

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