PROBLEMS ARISING OUT OF DEVIATION IN SOIL PROFILES DURING PROJECT EXECUTION

DIFFICULTES PROVENANT DES ECARTS DANS LES PROFILS DU SOL AU COURS DE LA MISE EN OEUVRE DE PROJETS

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SYNOPSIS : In most of the tenders for Civil Construction in India, the owners stipulate that the subsoil data provided is only indicative and the contractor should satisfy himself by an independent investigation. This is not practical both from time and cost considerations. In several cases, it is noticed that actual soil profile is substantially different from the one given in the tender and required substantial changes in design/construction. Two typical cases are highlighted.

It is a standard practice in India to stipulate by the owners in the tender for a project that the information provided in the tender on subsoil profiles and soil characteristics is for general information only and the owner is not responsible for the correctness of these informations. It is further stated that the contractor should satisfy himself about the correctness of this investigation and carry out, if desired, an independent soil investigation at the site before his offer for construction / execution of foundations and structures is given.

This stipulation, no doubt, safeguards the owner to avoid any disputes, if the soil strata during execution is found to be deviating from what is given in the tender document.

On the other hand from the contractor's point of view it is impossible for him to carry out an independent soil investigation within the limited time that is available between issue of tender documents and the time of submission of technical and financial bids. Also it is expensive. However, for fear of the offer not considered by the Tender Committee, the bidder blindly accepts the stipulation in the tender as given above.

It has been noticed by the author that, in a large number of projects, there are substantial difference between actual soil profiles and the profiles that are presented in the tender document. The reasons for such variations are :

1. Inadequate soil investigation in the begining (too few boreholes), last minute shift in the layouts with insufficient investigation in the new location etc.

2. Improper investigation, testing and interpretation by the boring contractor / soil consultant.

Two typical examples are shown in Figs.1 and 2. Fig.1a shows comparison of two boreholes for a railway over bridge near Madras. The bridge has 5 spans of 10.7 m with earth embankments on either sides. Boreholes 1 shows the soil profile as given in tender. Top two layers extending upto 7 m depth have SPT (N) values between 12 to 16 and the soil report recommended an allowable bearing pressure of 150 kN/m^2 for pier foundation at 2 m depth below ground level. Accordingly, the piers were constructed on shallow foundation. When four piers were completed and the fifth was under construction, the approach earth embankment of 9 m heigh suddenly failed. The embankment had a settlement of 2 m with corresponding heaving up of the soil by 1.5 m.

A confirmatory soil investigation was carried out and the average soil profile obtained is shown in Fig.1b. This reveals that except top 1 to 1.5 m layer of sandy clay, the soil is soft marine clay extending upto about 8 m below ground level.

Fig.2 shows comparison of two boreholes, made just 3 m apart from each other for confirmation for a petrochemical plant. Twelve such confirmatory boreholes carried out showed consistently that the SPT (N) values reported in original soil report are higher. The pile penetration depths decided based on the confirmatory boreholes resulted in large increase in piling quantity.

Consequences of such deviations are obvious to be commented upon. Thus, there is an urgent need to find a satisfactory solution to this alarming problem. The author is of the opinion that the prime responsibility for the correctness of the soil investigation should rest foremost with the company carrying out the soil investigation and laboratory testing. They should be made responsible of any significant deviations found in the soil profiles and test results during subsequent soil investigation / execution of the project. Any extra claims and damages that may arise out of the incorrect information in the soil investigation should be the responsibility of the party entrusted with the soil investigations. However, to take care of the natural variations in the soil profiles at a given site, one has to work out some norms for permissble deviations. It is opined that the variation to a very great extent will be minimised if standard practices are followed during the soil investigations which unfortunately is not the case quite often.

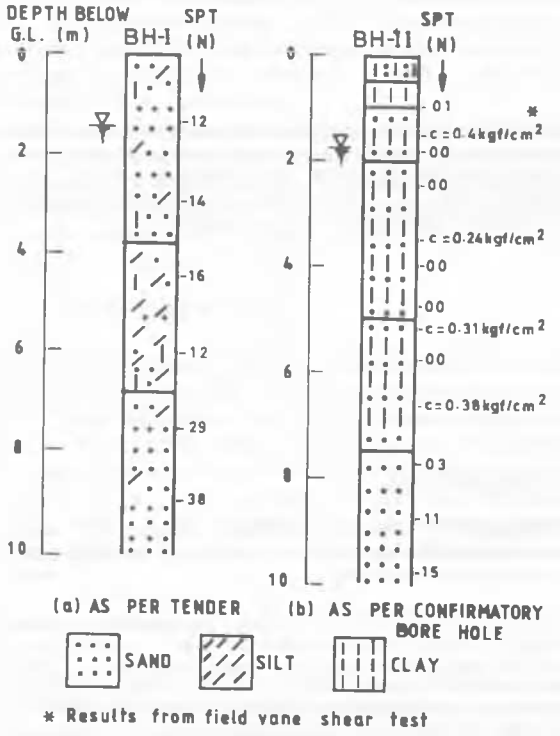

FIG. 1. COMPARISON OF BORE PROFILES

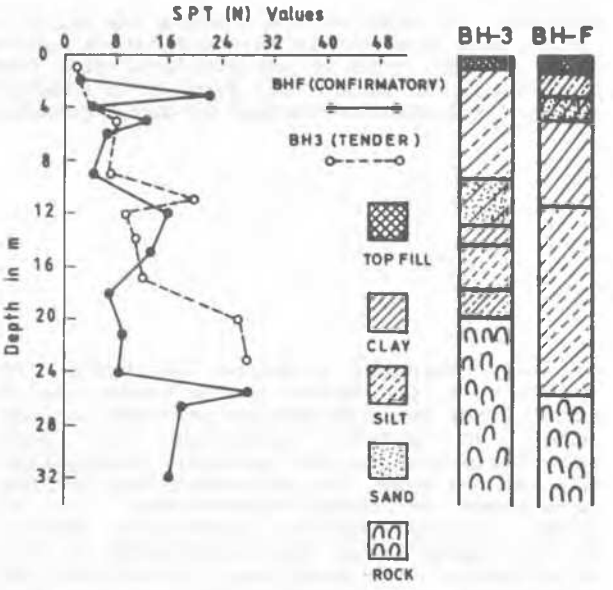

FIG. 2. COMPARISON OF BORE PROFILE & SPT VALUES