

### **Geotechnical Design Information**

Geotechnical design submissions involve the preparation of geotechnical plans and geotechnical reports. The submissions are ever increasing in complexity and volume. The employment of sophisticated geotechnical computer programs for design is common. To facilitate expeditious processing of submissions, it is important to maintain focus on the key issues throughout the design process and to organize the geotechnical plans, design reports and calculations clearly and systematically.

#### **Preparing for a Geotechnical Design**

2. Intensive developments in the urban areas and on hillsides have brought about various geotechnical stability issues with public safety concerns. To satisfactorily address these concerns, geotechnical designs should be carried out through a careful process with due attention given to every aspect of the design elements and the uncertainties involved. Standards and recommended good practice should be followed to ensure compliance with the current safety requirements. Reference can be made to Technical Guidance Note (TGN) No. 1 which contains a list of guidance documents being used by the Geotechnical Engineering Office as de facto geotechnical standards. The TGN can be found at the Civil Engineering and Development Department website <http://www.cedd.gov.hk/>.

3. The geotechnical feasibility of a development project should be examined at the general building plan stage and should be addressed if the site meets one or more of the criteria for submission of a geotechnical assessment for compliance with Building (Administration) Regulations (B(A)R) 8(1)(ba). The purpose of a geotechnical assessment is to identify at an early stage any fundamental geotechnical constraints that could affect the development and to adequately assess the geotechnical feasibility of the project. The criteria for submission and the essential contents of a geotechnical assessment are given in PNAP 78.

4. The importance of ground investigation for a geotechnical design cannot be overstressed. It is always a good practice to first formulate a preliminary geological model based on existing information obtained from a thorough desk study. The ground investigation fieldwork should then be planned with the objective of refining and confirming the geological model and the parameters to be used in the design, and identifying the various uncertainties involved as far as possible. Guidance on the execution of ground investigations is given in PNAP 132.

## **Geotechnical Design, Reports and Plans**

5. Design plans are intended to define the scope of proposed works and to demonstrate their feasibility and adequacy. The proposed works shall be designed and constructed so that during construction and thereafter there is an adequate margin of safety of the works and the remainder of the site. Furthermore, the carrying out of such works shall not render inadequate the margin of safety of, or impair the stability of, or cause damage to adjacent ground and facilities.

6. All accompanying geotechnical design reports should contain an executive summary to highlight the key elements of the design and the key issues addressed, which serves as an explanatory guide to the submission. The report must, inter alia, contain a schedule of geotechnical design assumptions and parameters adopted. Clear justifications with relevant supporting documents (e.g. ground investigation reports, laboratory testing results, groundwater monitoring data, etc.) should be provided in the report regarding the choice of parameters and design assumptions.

7. It is a good practice to incorporate provisions for design reviews during construction such that the key design assumptions can be validated or design modifications can be made if changes in design parameters are found necessary. This is particularly important for sites with complex subsurface conditions, or involving unconventional engineering schemes. Guidance on this aspect is given in PNAP 246.

8. It is often noted that many of the plans submitted do not comply with the requirements stipulated in the related B(A)R and Building (Construction) Regulations (B(C)R), thus resulting in delay in subsequent processing. The proposed works shall be clearly differentiated from existing works (B(A)R 14 refers). The plans shall be prepared to clearly show the mutual effects between the proposed works and the existing conditions of the site. Attention should also be given in the preparation of plans to avoid some common deficiencies such as inaccurate site survey data, insufficient safety precautions (e.g. temporary support to adjacent ground or precautionary measures for heavy rainfall), unclear construction sequence, discrepancies between plans and design reports and insufficient detailing.

## **Geotechnical Requirements for Site Formation Plans and Other Types of Plans**

9. The preparation of site formation plans and associated designs and reports shall adhere closely to the requirements as specified in B(A)R 8(1)(bb). Guidance on site formation filling work is provided in PNAP 55.

10. Excavation and lateral support plans often contain significant geotechnical contents. The requirements for preparing the design, reports and plan are clearly spelt out in B(A)R 8(1)(bc) and PNAP 148. Guidance on information to be submitted with the excavation and lateral support plans relating to dewatering in basement excavations is provided in PNAP 74.

11. Developments in Scheduled Area No. 1 (Mid-levels Scheduled Area) and foundation works in Scheduled Area Nos. 2 and 4 (North West New Territories and Ma On Shan Scheduled Areas) are subject to additional geotechnical control. The geotechnical requirements and information to be submitted for such developments are given in PNAP 85 and PNAP 161 respectively. Furthermore, the administrative procedures and general guidance for developments in the Designated Area of Northshore Lantau are given in PNAP 283.

12. The design and construction of foundations in the vicinity of geotechnical features or on sloping ground requires careful geotechnical consideration to ensure that the works will not induce adverse effects (e.g. damming effects on the groundwater regime, additional loading or vibration effects onto the ground, etc.) to the adjacent ground so as to be in compliance with B(C)R 23. B(A)R 8(1)(d) spells out what needs to be included in a foundation plan.

13. Where an existing building which provides support to the adjacent ground is to be demolished, due consideration should be given to ensure that the stability of the adjacent ground is not adversely affected. Demolition debris shall not be stockpiled in the vicinity of any geotechnical features. The requirements for preparing the plans in respect of the demolition works of such structure are provided in B(A)R 8(3)& (4) and PNAP 71.

#### **Use of Geotechnical Computer Programs in Submissions to BA**

14. All calculations contained in geotechnical design reports for submission to BA should be properly indexed and arranged in a logical sequence. The calculations should show clearly the sections analysed, the geological and hydrogeological model and soil parameters used. In the case that the calculations are performed by a pre-accepted geotechnical computer program (PNAP 79), the following essential information should be included.

- (i) The name, version, developer's name/identification, BD reference number and validity period of the computer program used;
- (ii) The scope of application of the program which is accepted by BD and a list of the limitations in application;
- (iii) The justifications on the simulation of the problems by the mathematical models used in the computer program;
- (iv) Assumptions made and justifications on parameters used in the computer model e.g. material properties, boundary conditions etc;
- (v) The preparation of the input data from the ground conditions;

- (vi) Summary of salient output results e.g. factors of safety of slopes and retaining walls under critical ground conditions, design envelopes of moment, shear, displacement of lateral support systems for excavations, ground displacement; and
- (vii) The interpretation and application of the computer output in the design.

15. The Registered Geotechnical Engineer (RGE) is required to complete the standard proforma in Appendix A and include it in the submission.



( H W CHEUNG )  
Building Authority

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Index under : Geotechnical Design Information  
Geotechnical Computer Programs

**Geotechnical Computer Program Statement**

BD file ref. no. : .....

Address of site : .....

Registered Geotechnical Engineer : .....

Geotechnical computer programs used :-

Program Name	BD Ref. No.
(1)†.....	.G.....
(2)†.....	.G.....
(3)†.....	.G.....

Above programs were used to analyse the following designs († insert the appropriate number from table in brackets) :-

- ( ) Earth-retaining Structures
- ( ) Excavation and Lateral Support Works
- ( ) Slope Works
- ( ) Others (please specify) .....

I confirm that I am responsible for executing the geotechnical computer programs in respect of the above designs.

The information about the geotechnical computer programs is also enclosed in pursuance of paragraph 14 of PNAP 274.

Signature of RGE : ..... Date : .....

& Full name (in block letters) : .....

Certificate of Registration No. : ..... Expiry date : .....

\* Delete whichever is inapplicable