Rock Faces
Building (Planning) Regulations 27 and 47

For the purposes of Building (Planning) Regulation 47, only a widely-jointed (spacing over 600mm) rock face having no unfavourably oriented joints or other discontinuities or other defects will be regarded as a "massive rock face". For slopes other than "massive rock face", the provisions of Building (Planning) Regulation 27 will apply.

2. The Appendix of this PNAP elaborates on the requirements on submission of site formation plans involving rock faces and the standard of good practice to enable safety of rock faces. The importance of engaging qualified geotechnical engineers in the rock face survey is stressed and the lessons learnt from past rock face failures including the Fei Tsui Road fatal landslide are incorporated.

3. Adequate measures should be taken to prevent uncontrolled rockfalls during construction. This is particularly important for works on existing rock faces that affect public safety.

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Ref. : BD GP/BREG/P/28

First issued June 1979
Last update May 1994
This update December 1996 (AD/SE,GGE/I)

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Requirements on Submission of Site Formation Plans Involving Rock Faces

The purpose of this Appendix is to lay down the requirements on submission of site formation plans involving rock faces and to elaborate on the standard of good practice to enable safety of rock faces both during construction and in the long term. The importance of engaging qualified geotechnical engineers in the rock face survey is stressed and the lessons learned from past rock face failures including the Fei Tsui Road Fatal Landslide are incorporated.

2. As for design of other types of slopes, design of rock faces starts with site investigation which may include site reconnaissance, aerial photograph interpretation, engineering geological field mapping and drillhole investigation. Rock mass condition including information on discontinuities could be obtained by appropriate field and laboratory testing such as packer (water absorption) tests, impression packers and close circuit television surveying, etc. Useful information on this aspect is contained in the Geotechnical Manual for Slopes, Geoguide 2 - Guide to Site Investigation and Geoguide 4 - Guide to Cavern Engineering. Some guidelines on shear strength of rock mass and rock joints can be found in Geoguide 1 - Guide to Retaining Wall Design.

3. Methods of stability analysis and principle stabilisation measures for rock slopes are summarised in Tables 5.6 and 5.7 of the Geotechnical Manual for Slopes.

4. Persons responsible for the formation of rock faces will rarely be able to assess the full extent of the stability problem until excavation is nearly completed. Only then will the spacing, persistence, orientation and other characteristics (such as nature of constituent infill materials, roughness and aperture size) of discontinuities and other planes of weakness in the rock be revealed. It is, therefore, frequently necessary to make assumptions about the jointing pattern an other characteristics in order to evaluate the overall stability of the rock slope and to make provision for local support of the final face and, as appropriate, general support of the rock slope. These assumptions and the basis for them must be clearly and fully stated on the site formation plans submitted for approval.

5. Such plans should also contain notes on observance of the following standard of good practice :

a) any blasting to be carried out shall be controlled to avoid damage to the final face. Pre-split or smooth-face methods shall be used to form the final face in suitable geological conditions;

b) if expanding agents are to be used for rock splitting, the method to prevent the uncontrolled flow of the expanding agents shall be stated, and any adverse effect on the stability of rock faces shall be assessed;

c) immediately after excavation, the intended final face shall be scaled by removing loose material and shall be surveyed by a qualified geotechnical engineer or engineering geologist, e.g. Registered Professional Engineer (Geotechnical) with adequate experience in the design and construction of rock faces. The survey shall include the identification of any water seepages and weak or relatively impermeable geological zones or structures which may have adverse effect on the stability of the slope (for example, unfavourably oriented persistent layers of kaolinitic clay in altered or weathered rocks). Results of the survey shall be used in the design and detailing of support measures, rockfall control measures and drainage measures; and

d) large-scale engineering geological drawings (marked-up transparent overlays to photographs or otherwise), showing all salient rock features including any weak or relatively impermeable geological zones or structures together with appropriate descriptions in accordance with Geoguide 3, the dimensioned location, dimensioned extent and details of all support and drainage measures, shall be submitted for the approval of the Building Authority. Documentation will also be required on :

i) calculations and supporting data to justify the design of all support measures and to confirm overall stability;

ii) photographs of the scaled rock faces, where physically possible.

6. With regard to para 5(c), your attention is drawn to the Geotechnical Engineering Office Investigation Report on the Fei Tsui Road Fatal Landslide of 13 August 1995. The existence of an unfavourably oriented persistent layer of weak and relatively impermeable material in the ground is a principal cause of failure. A copy of the report is available for inspection in the Civil Engineering Library of the Civil Engineering Building at 101 Princess Margaret Road, Homantin, Kowloon.