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**Environment, Transport and Works Bureau**  
**Technical Circular (Works) No. 13/2005**

**Prescriptive Measures for Stabilisation and Improvement of  
Man-made Slopes and Standardised Debris-resisting Barriers for  
Mitigation of Natural Terrain Landslide Hazards**

**Scope**

This Circular promulgates the use of prescriptive measures for stabilisation and improvement of man-made slope features, and the use of standardised debris-resisting barriers for mitigation of natural terrain landslide hazards.

2. The Director of Agriculture, Fisheries & Conservation, Director of Home Affairs, Director of Housing and Director of Lands have agreed to the contents of this Circular.

**Effective Date**

3. This Circular takes immediate effect.

## **Effect on Existing Circular**

4. This Circular supersedes Works Bureau Technical Circular (WBTC) No. 11/2000 which is hereby cancelled, and should be read in conjunction with WBTC Nos. 9/96 and 26/99, and ETWB TC(W) Nos. 29/2002 and 20/2004.

## **Background**

5. Prescriptive measures are pre-determined, experience-based and suitably conservative modules of works prescribed to a man-made slope feature to improve its stability or reduce the risk of failure, without the need for detailed ground investigation and design analyses. Standardised debris-resisting barriers are pre-determined and suitably conservative modules of barriers formulated by applying and extending the methodology developed earlier by the Geotechnical Engineering Office (GEO) of the Civil Engineering and Development Department for the design of debris-resisting barriers for mitigation of natural terrain landslide hazards.

6. Using prescriptive measures and standardised debris-resisting barriers in slope works would save time and human resources, and may be more economical in some circumstances. Technical guidelines on the applications of prescriptive measures and standardised debris-resisting barriers have been issued by the GEO and will be updated by the GEO from time to time.

## **Policy**

### *Prescriptive Measures for Stabilisation and Improvement of Man-made Slope Features*

7. All project and maintenance departments should employ prescriptive measures for the following types of slope works as much as possible:

- (a) preventive maintenance of slopes,
- (b) urgent repairs to landslips, and
- (c) upgrading of substandard slopes.

8. The terms ‘preventive maintenance’ and ‘upgrading’ are as defined in Geoguide 5: Guide to Slope Maintenance.

9. The technical guidance, including qualifying criteria, are given in the following documents:

- (a) GEO Report No. 56 "Application of Prescriptive Measures to Slopes and Retaining Walls" (Second Edition).
- (b) GEO Technical Guidance Notes No. 9 “Updating of GEO Report No. 56 – Application of Prescriptive Measures to Slopes and Retaining Walls (Second Edition)”.
- (c) GEO Technical Guidance Notes No. 13 “Guidelines on the Use of Prescriptive Measures for Rock Cut Slopes” (Related Report: GEO Special Project Report SPR 3/2003).
- (d) GEO Technical Guidance Notes No. 17 “Prescriptive Soil Nail Design for Concrete and Masonry Retaining Walls” (Related Report: GEO Special Project Report SPR 2/2004).
- (e) GEO Technical Guidance Notes No. 21 “Design of Soil Nail Heads” (Related Report: GEO Special Project Report SPR 8/2004).

The technical guidelines on the use of prescriptive measures given in the above documents and any other relevant guidance documents promulgated by the GEO from time to time should be followed.

10. In arranging the Engineer Inspections by consultants, the consultants should be required to recommend, where necessary and applicable, prescriptive measures as a means for upgrading or preventive maintenance of the slopes. This is to bring about maximum improvement to the large number of existing old slopes in a relatively short time under the constraint of available resources.

*Standardised Debris-resisting Barriers for Mitigation of Natural Terrain Landslide Hazards*

11. All project and maintenance departments may apply standardised debris-resisting barriers to the following circumstances where considered appropriate:

- (a) as urgent protective works following natural terrain landslides, and
- (b) as design provisions or contingency measures in new or existing developments.

12. The current recommended practice and procedures for studying natural terrain landslide hazards, and the technical guidance, including the criteria and recommended procedures for application, given in GEO Special Project Report Nos. SPR 1/2002 "Guidelines for Natural Terrain Hazard Studies" and SPR 9/2004 "Use of Standardised Debris-resisting Barriers for Mitigation of Natural Terrain Landslide Hazards" respectively and any other relevant guidance documents promulgated by the GEO from time to time should be followed.

#### Technical Guidance Documents

13. All the GEO Reports, Technical Guidance Notes and Special Project Reports mentioned in this Circular can be viewed and downloaded from the Civil Engineering and Development Department's website <http://www.cedd.gov.hk>.

### **Personnel for Design and Review During Construction**

#### Prescriptive Measures for Stabilisation and Improvement of Man-made Slope Features

14. The prescriptive measures items should be specified by a geotechnical engineer professionally qualified and experienced in Hong Kong, as should the construction review. A suitable qualification is Registered Professional Engineer (Geotechnical). For preventive maintenance works which involve only surface protection and surface drainage prescriptive measures, the prescriptive design and construction review may also be carried out by a professionally qualified civil engineer competent in site formation and drainage works.

15. For preventive maintenance works, it is often more cost-effective to ask the same professional engineer who undertakes the Engineer Inspection for the slope to also specify the items of prescriptive measures required as part of the preventive maintenance recommendations. This should be arranged wherever possible.

16. Construction review includes a review of the suitability and adequacy of the specified prescriptive measures items during construction and giving recommendations on any design modifications necessary to take into account the actual site and ground conditions revealed. It should always be carried out for prescriptive measures specified as upgrading and preventive maintenance works. It should also be undertaken for prescriptive measures specified as urgent repair where practicable. The professional engineer undertaking this work should be familiar with all available information collected in the desk study and site reconnaissance. Where it is possible to arrange for the same professional engineer who has specified the prescriptive measures items to carry out the construction review, this should be done.

*Standardised Debris-resisting Barriers for Mitigation of Natural Terrain Landslide Hazards*

17. A team of geotechnical engineers and engineering geologists working together is normally required to assess the natural terrain landslide hazards and design the necessary mitigation works. The location and sizing of a standardised debris-resisting barrier, together with the necessary local site formation works for the construction of the landslide mitigation measures, should be specified by a geotechnical engineer professionally qualified and experienced in Hong Kong. A suitable qualification is Registered Professional Engineer (Geotechnical). Engineering geological expertise is needed for certain elements of the assessment of natural terrain landslide hazards. Assistance from an experienced engineering geologist should therefore be sought by the responsible geotechnical professional, as necessary.

18. For continuity, it would be preferable if the personnel responsible for the assessment of natural terrain landslide hazards could also be made responsible for applying the standardised debris-resisting barrier framework.

19. Regular reviews should be carried out during construction. These should include an inspection of the site and an assessment of the geology, groundwater conditions and the environmental effect of works during the various stages of construction. The suitability of the layout of the barriers and drainage provisions should also be reviewed, taking due account of the actual site conditions. The professional engineer undertaking the review should be conversant with the design assumptions.

## **Submission for Checking**

20. Design of upgrading works for the whole or part of a man-made slope feature using prescriptive measures should be submitted to the GEO for checking. The design of permanent natural terrain landslide mitigation works involving standardised debris-resisting barriers should also be subject to GEO checking. GEO checking on the design of the prescriptive measures and standardised debris-resisting barriers will be waived if :

- (a) an adequate quality system is in place to ensure that the personnel requirements stipulated in the above paragraphs and the technical guidance given by the GEO are followed, and
- (b) satisfactory documentary evidence (including proof of quality system and professional details of personnel for design and construction) is submitted to the GEO prior to commencement of the works to indicate that condition (a) will be satisfied.

21. Submission to the GEO is not required for prescriptive measures used in urgent repair and preventive maintenance, and for standardised debris-resisting barriers used in urgent protective works. Notwithstanding this, the project and maintenance departments are encouraged to consult the GEO on the scope of urgent repair/urgent protective works required to remove any immediate threat to life or property following the occurrence of landslides.

22. Submission to the GEO for checking or agreement is, however, still required for the following:

- (a) for rock cut slopes, the assessment of the potential for global instability and the rock mass failure mechanisms not treated by prescriptive measures ( the waiving of GEO checking, if given, covers only the modes of failure of rock cut slopes to be treated by prescriptive measures following GEO's technical guidance),
- (b) for standardised debris-resisting barriers, the assessment of the design volume and the detailing of the barriers to suit the site conditions (the waiving of GEO checking, if given, covers only the assessment of the dimensions and locations of the barriers), and

- (c) geotechnical supervision personnel to supervise the works (the requirements for geotechnical supervision are to be imposed by the GEO with due regard to the type and complexity of the works).

23. Application for waiving of GEO checking, if intended, should be submitted to the relevant GEO District Divisions prior to the commencement of the works.

### **Records and Review**

24. In all cases of application of prescriptive measures, record sheets should be completed on certification of satisfactory completion of the prescriptive works by the responsible professional engineer. Sample record sheets are given in GEO Report No. 56, SPR 3/2003 and SPR 2/2004. There is no need to submit the record sheets, the Engineer Inspection Report and the associated desk study and site inspection records to the GEO, although copies should be made available upon request to assist the GEO in review of the technical guidance promulgated.

25. The Maintenance Manual for an existing man-made slope should be updated within six months of completion of the prescriptive works. Also, natural terrain landslide hazard mitigation measures require maintenance and therefore a Maintenance Manual should be prepared within six months of completion of a standardised debris-resisting barrier. There is no need to submit the new/updated Maintenance Manuals to the GEO, although copies should be made available upon request.

26. Departments should set up their own system to maintain traceable records on prescriptive measures and standardised debris-resisting barriers certified by the responsible professional engineers.

( C S Wai )

**Deputy Secretary for the Environment,  
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