

Geoguide 5 – Guide to Slope Maintenance**Third Edition****AMENDMENT NO.: GG5/01/2018****BACKGROUND**

A review on the Geoguide 5 has been conducted with a view to updating the guidance pertaining to the maintenance of water-carrying services affecting slopes. This amendment sheet incorporates the recommendations given in the Code of Practice on Monitoring and Maintenance of Water-Carrying Services Affecting Slopes (Second Edition) (ETWB, 2006) and revisions to template of Maintenance Manual, Model Brief for Stability Assessments for Private Slopes or Retaining Walls, Record Sheets and Model Brief for Engineer Inspections to reflect the current practices in the maintenance of water-carrying services affecting slopes. The major amendments are as follows:-

- (a) where leakage is suspected from exposed or buried water-carrying services, prompt arrangement should be made by the relevant services' owners, maintenance parties or relevant authorities for the investigation and repair of the services in accordance with "Code of Practice on Monitoring and Maintenance of Water-Carrying Services Affecting Slopes" (ETWB, 2006); and
- (b) the scope of Engineer Inspections for Maintenance under the following items are only applicable to those water-carrying services belonging to the owner of or the party required to maintain the slope/retaining wall:-
 - (i) the assessment of the required frequency of Regular Checks of Buried Water-carrying Services; and
 - (ii) the checking of whether Regular Checks of Buried Water-carrying Service had been carried out and documented satisfactorily.

This amendment sheet also incorporates the lessons learned arising from a rockfall incident in 2012 as given in GEO Report No. 312 (Lee et al, 2015). The updated technical guidance is pertinent to the fixing of wire mesh on rock slopes.

Relevant references quoted in the Geoguide 5 are also updated.

The above amendments are given below.

AMENDMENTS**CHAPTER 1**

(a) Section 1.1

INTRODUCTION

In paragraph 2, line 7, delete ‘(GEO, 2003a)’ and substitute ‘(GEO, 2003)’.

(b) Section 1.2

In paragraph 4, line 5, delete ‘(http://hkss.ced.gov.hk)’ and substitute ‘(http://hkss.cedd.gov.hk)’.

CHAPTER 2

(c) Section 2.2

MAINTENANCE MANAGEMENT

In paragraph 7, after the 1st sentence, add ‘The Geotechnical Engineering Office has launched a Landslip Prevention and Mitigation Programme (LPMitP) to dovetail with the Landslip Preventive Measures Programme, which was completed in 2010. The LPMitP aims to deal with the landslide risk arising from man-made slopes and natural hillside.’.

In paragraph 7, delete the 2nd sentence, and substitute the following:

‘Reports on Stability Assessment and design of landslip preventive measures as well as natural terrain hazard mitigation measures carried out under these programmes are available for reference in the Civil Engineering Library of the Civil Engineering and Development Department.’

(d) Section 2.3

Delete Section 2.3 and renumber Section 2.4 as new Section 2.3.

CHAPTER 3

(e) Section 3.1.1

MAINTENANCE REQUIREMENTS FOR MAN-MADE SLOPES AND RETAINING WALLS

In paragraph 1, revise ‘item (i)’ as follows:

- (i) checking for signs of leakage of buried and exposed water-carrying services and, if signs of leakage are identified, alerting relevant services’ owners, maintenance parties or relevant authorities to take prompt actions.

In paragraph 2, line 2, add ‘by owners or parties responsible for maintaining these water-carrying services’ after ‘...should be undertaken’.

In paragraph 3, delete the 1st sentence and substitute the following:

Where leakage is suspected from exposed or buried water-carrying services such as water pipes, water supply mains, sewers, stormwater drains or their ducting systems, prompt arrangement should be made by the relevant services’ owners, maintenance parties or relevant authorities for the investigation and repair of the services in accordance with “Code of Practice on Monitoring and Maintenance of Water-Carrying Services Affecting

Slopes” (ETWB, 2006).

- (f) Section 3.1.4 **In paragraph 4, line 9, delete** ‘GEO Publication No. 1/2000: “Technical Guidelines on Landscape Treatment and Bio-engineering for Man-made Slopes and Retaining Walls” (GEO, 2000a)’ **and substitute** ‘GEO Publication No. 1/2011: “Technical Guidelines on Landscape Treatment for Slopes” (GEO, 2011)’.

In paragraph 4, line 11, delete ‘(GEO, 2002a)’ **and substitute** ‘(GEO, 2012)’.

- (g) Section 3.1.5 **In paragraph 1, line 2, add** ‘spillage or overflow of drainage channels,’ **after** ‘...such as signs of leakage,’.

- (h) Section 3.2.1 **In paragraph 2, revise** ‘item (h)’ **as follows:**

(h) to identify the presence of exposed and buried water-carrying services on or in the vicinity of the slope or retaining wall (including relevant areas outside the lot boundary), check for signs of leakage of the services, and, in case that signs of leakage are identified, alert relevant services’ owners, maintenance parties or relevant authorities to take prompt actions (e.g. immediate detailed checks, regular checks, repair or re-routing of the services), as necessary,

Add the following new paragraph after paragraph 2 :-

For actions pertaining to Regular Checks of Buried Water-carrying Services under the scope of Engineer Inspections for Maintenance mentioned in items (f) and (i) above, they apply only to those services belonging to the owner of or the party required to maintain the slope/retaining wall.

- (i) Section 3.3.2 **Revise Section 3.3.2 as follows:**

The owners or parties responsible for maintaining water-carrying services shall follow the frequency for Regular Checks of Water-carrying Services as recommended in Chapter 2 of “Code of Practice on Monitoring and Maintenance of Water-Carrying Services Affecting Slopes” (ETWB, 2006).

- (j) Section 3.3.3 **In line 3, delete** ‘ “Code of Practice on Inspection & Maintenance of Water Carrying Services Affecting Slopes” (Works Branch, 1996)’ **and substitute** ‘ “Code of Practice on Monitoring and Maintenance of Water-Carrying Services Affecting Slopes” (ETWB, 2006)’.

- (k) Section 3.5.1 **In paragraph 4, line 5, delete** ‘ Practice Notes for Authorized Persons and Registered Structural Engineers No. 137 ’ **and substitute** ‘ Practice Note for Authorized Persons and Registered Structural Engineers No. APP-51 ’.

CHAPTER 4

TECHNICAL ASPECTS OF MAINTENANCE FOR MAN-MADE SLOPES AND RETAINING WALLS

- (l) Section 4.5 **In paragraph 6, line 2, delete** ‘Technical Guidance Note No. 13 (GEO, 2003b)’ **and substitute** ‘GEO Publication No. 1/2009: “Prescriptive Measures for Man-made Slopes and Retaining Walls” (GEO, 2009)’.

In paragraph 7, add ‘Adequate anchorage points should be provided to ensure that rock mesh netting closely follows the rock slope profile as far as practical, particularly along the edge of the rock mesh netting on rugged rock surface to prevent any potential loose blocks from falling out from the opening between the netting and the rock surface.’ **after the 3rd sentence.**

- (m) Section 4.8 **In paragraph 5, line 6, delete** ‘(GEO, 2002b)’ **and substitute** ‘(GEO, 2002)’.

- (n) Section 4.9.1 **In paragraph 3, line 1, delete** ‘ “Code of Practice on Inspection & Maintenance of Water Carrying Services Affecting Slopes” (Works Branch, 1996)’ **and substitute** ‘ “Code of Practice on Monitoring and Maintenance of Water-Carrying Services Affecting Slopes” (ETWB, 2006)’.

- (o) Section 4.12 **In line 9, delete** ‘(GEO, 2003c)’ **and substitute** ‘(GEO, 2007)’.

- (p) Section 4.13 **Revise the heading of this Section as** ‘4.13 CHECKING CERTIFICATES FOR GOVERNMENT SLOPES AND RETAINING WALLS’.

In paragraph 1, line 4, delete ‘Works Bureau Technical Circular No. 16/2001 (Works Bureau, 2001)’ **and substitute** ‘Environment, Transport and Works Bureau Technical Circular (Works) No. 20/2004 (ETWB, 2004)’.

- (q) Section 4.14 **In line 3, delete** ‘(GEO, 2000b)’ **and substitute** ‘(GEO, 2006)’.

CHAPTER 5

PREVENTIVE MAINTENANCE WORKS

- (r) Section 5.1 **In paragraph 3, line 2, delete** ‘GEO Report No. 56 (Wong et al, 1999), Technical Guidance Note No. 13 (GEO, 2003b) and Technical Guidance Note No. 17 (GEO, 2004)’ **and substitute** ‘ “GEO Publication No. 1/2009: “Prescriptive Measures for Man-made Slopes and Retaining Walls” (GEO, 2009)” ’.

CHAPTER 8

(s) Section 8.1

SOURCES OF INFORMATION**Revise paragraph 2 as follows:-**

The Geotechnical Engineering Office of the Civil Engineering and Development Department manages a Slope Information System that contains up-to-date information on registered man-made slopes and retaining walls, disturbed terrain features and landslide hazard mitigation measures within the Hong Kong Special Administrative Region. The Slope Information System can be accessed from the “Hong Kong Slope Safety” website (<http://hkss.cedd.gov.hk>). The Citizen’s Easy Link (Tel.: 1823) provides advice to the general public on matters relating to maintenance of slopes and retaining walls, and suggests appropriate sources for more specific information.

In paragraph 3, line 2, delete ‘Civil Engineering Department’ and substitute ‘Civil Engineering and Development Department’.

In paragraph 3, line 6, add ‘and Landslip Prevention and Mitigation Programme’ after ‘...Landslip Preventive Measures Programme’.

Delete paragraph 15.

(t) Section 8.2

In paragraph 1, line 1, delete ‘(GEO, 2003a)’ and substitute ‘(GEO, 2003)’.

In paragraph 1, line 5, delete ‘“Layman’s Guide on Landscape Treatment of Slopes and Retaining Walls” (GEO, 2002a)’ and substitute ‘“Layman’s Guide on Landscape Treatment of Slopes” (GEO, 2012)’.

In paragraph 1, line 9, delete ‘(http://hkss.ced.gov.hk)’ and substitute ‘(http://hkss.cedd.gov.hk)’.

In paragraph 2, line 2, delete ‘“Code of Practice on Inspection & Maintenance of Water Carrying Services Affecting Slopes” (Works Branch, 1996)’ and substitute ‘“Code of Practice on Monitoring and Maintenance of Water-Carrying Services Affecting Slopes” (ETWB, 2006)’.

REFERENCES

(u)

Add the following new references:

BOO (1990). *Monitoring and Maintenance of Horizontal Drains (Practice Note for Authorized Persons and Registered Structural Engineers No. APP-51)*. Buildings Ordinance Office, Hong Kong, 5 p.

ETWB (2004). *GEO Checking Certificate for Slopes and Retaining Walls (Environment, Transport and Works Bureau Technical Circular (Works) No. 20/2004)*. Environment, Transport and Works Bureau, Hong Kong, 4 p.

ETWB (2006). *Code of Practice on Monitoring and Maintenance of Water-Carrying Services Affecting Slopes. (Second edition)*. Environment, Transport and Works Bureau, Hong Kong, 93 p.

GEO (2002). *Guide to Reinforced Fill Structure and Slope Design (Geoguide 6)*. Geotechnical Engineering Office, Hong Kong, 236 p.

GEO (2003). *Layman's Guide to Slope Maintenance. (Third Edition)*. Geotechnical Engineering Office, Hong Kong, 36 p.

GEO (2006). Report on the Shek Kip Mei Landslide of 25 August 1999 (*GEO Report No. 181*). Geotechnical Engineering Office, Hong Kong, 167 p.

GEO (2007). *Guidelines for Classification of Consequence-to-life Category for Slope Features (Technical Guidance Note No. 15)*. Geotechnical Engineering Office, Hong Kong, 14 p.

GEO (2009). *Prescriptive Measures for Man-made Slopes and Retaining Walls (GEO Publication No. 1/2009)*. Geotechnical Engineering Office, Hong Kong, 74 p.

GEO (2011). *Technical Guidelines on Landscape Treatment for Slopes (GEO Publication No. 1/2011)*. Geotechnical Engineering Office, Hong Kong, 217 p.

GEO (2012). *Layman's Guide to Landscape Treatment of Slopes*. Geotechnical Engineering Office, Hong Kong, 29 p.

(v)

Delete the following references:

BOO (1990). *Monitoring and Maintenance of Horizontal Drains (Practice Note for Authorized Persons and Registered Structural Engineers No. 137)*. Buildings Ordinance Office, Hong Kong, 5 p.

GEO (2000a). *Technical Guidelines on Landscape Treatment and Bio-Engineering for Man-made Slopes and Retaining Walls (GEO Publication No. 1/2000)*. Geotechnical Engineering Office, Hong Kong, 146 p.

GEO (2000b). Report on the Shek Kip Mei Landslide on 25 August 1999. Geotechnical Engineering Office, Hong Kong, 156 p.

GEO (2002a). *Layman's Guide to Landscape Treatment of Slopes and Retaining Walls*. Geotechnical Engineering Office, Hong Kong, 24 p.

GEO (2002b). *Guide to Reinforced Fill Structure and Slope Design (Geoguide 6)*. Geotechnical Engineering Office, Hong Kong, 236 p.

GEO (2003a). *Layman's Guide to Slope Maintenance. (Third Edition)*. Geotechnical Engineering Office, Hong Kong, 36 p.

GEO (2003b). *Guidelines on the Use of Prescriptive Measures for Rock Cut Slopes (Technical Guidance Note No. 13)*. Geotechnical Engineering Office, Hong Kong, 2 p.

GEO (2003c). *Guidelines for Classification of Consequence-to-life Category for Slope Features (Technical Guidance Note No. 15)*. Geotechnical Engineering Office, Hong Kong, 14 p.

GEO (2004). *Prescriptive Soil Nail Design for Concrete and Masonry Retaining Walls. (Technical Guidance Note No. 17)*. Geotechnical Engineering Office, Hong Kong, 1 p. (under preparation).

Wong, H.N., Pang, L.S., Wong, A.C.W., Pun, W.K. & Yu, Y.F. (1999). *Application of Prescriptive Measures to Slopes and Retaining Walls (GEO Report No. 56). (Second edition)*. Geotechnical Engineering Office, Hong Kong, 73 p.

Works Branch (1996). *Code of Practice on Inspection & Maintenance of Water Carrying Services Affecting Slopes*. Works Branch, Hong Kong Government, 18 p.

Works Bureau (2001). *GEO Checking Certificate for Slopes and Retaining Walls (Works Bureau Technical Circular No. 16/2001)*. Works Bureau, Government of the Hong Kong Special Administrative Region, 7 p.

APPENDIX A

(w) Sheet 4 of 8

INDICATIVE FORMAT FOR MAINTENANCE MANUAL FOR MAN-MADE SLOPES AND RETAINING WALLS

In the item '(c) Frequency of Regular Check of Water-Carrying Services (including buried services, ducting systems):' **under the box** 'FREQUENCY OF MAINTENANCE INSPECTIONS', **inert Footnote** '(1)'.

At the bottom of this Sheet, add ‘Note : (1) It applies only to those water-carrying services belonging to the owner of or the party required to maintain the slope/retaining wall.’

APPENDIX C

MODEL BRIEF FOR ENGINEER

INSPECTIONS FOR MAINTENANCE FOR PRIVATE SLOPES

(x) **Add ‘Relevant Section in Geoguide 5’ and the respective section nos. in the right margin of relevant pages for reference.**

(y) Section 4 **In Part 1 – Information Collection, item (b), line 2, add ‘, including all relevant slope maintenance records’ after ‘... implications on its stability’.**

In Part 2 – Site Inspection, item (a)(v), line 3, delete ‘and provide recommendations in accordance with Part 4(c) below’.

In Part 3 - Assessment, item (d), line 2, add ‘(see Note 1)’ after ‘... (including any ducting systems housing the services)’.

In Part 3 - Assessment, item (f), line 3, add ‘(see Note 1)’ after ‘... (including any ducting systems housing the services)’.

Add the following at the end of Part 3 - Assessment :-

(Note 1: For the above actions under items (d) and (f) pertaining to Regular Checks of Buried Water-carrying Services, they apply only to those services belonging to the owner of or the party required to maintain the slope/retaining wall.)

In Part 4 - Recommendations, item (c), line 1, delete the first two sentences, and substitute ‘Based on the task of Part 2(a)(v), where leaky water-carrying services are found, advise the relevant services’ owners, maintenance parties or relevant authorities for actions in accordance with ETWB (2006).’.

(z) Section 6 **In line 6, delete ‘Civil Engineering Department web site at <http://www.ced.gov.hk>.’ and substitute ‘Civil Engineering and Development Department web site at <http://www.cedd.gov.hk>.’.**

APPENDIX D

SCOPE OF SERVICES FOR ENGINEER INSPECTIONS FOR MAINTENANCE FOR GOVERNMENT SLOPES

(aa) **Add ‘Relevant Section in Geoguide 5’ and the respective section nos. for reference in the right margin of relevant pages.**

(ab) Section 2 **In Part 2 - Site Inspection, item (a)(v), line 3, delete ‘and provide recommendations in accordance with Part 4(c) below’.**

In Part 2 - Site Inspection, item (d), line 2, delete ‘Environment, Transport and Works Bureau’ **and substitute** ‘Development Bureau’.

In Part 3 - Assessment, item (d), line 2, add ‘(see Note 1)’ **after** ‘... (including any ducting systems housing the services)’.

In Part 3 - Assessment, item (f), line 3, add ‘(see Note 1)’ **after** ‘... (including any ducting systems housing the services)’.

In Part 3 - Assessment, item (g), line 5, delete ‘Environment, Transport and Works Bureau’ **and substitute** ‘Development Bureau’.

Add the following at the end of Part 3 - Assessment :-

(Note 1: For the above actions under items (d) and (f) pertaining to Regular Checks of Buried Water-carrying Services, they apply only to those services belonging to the owner of or the party required to maintain the slope/retaining wall.)

In Part 4 - Recommendations, item (c), line 1, delete the first two sentences and substitute ‘Based on the task of Part 2(a)(v), where leaky water-carrying services are found, advise the relevant services’ owners, maintenance parties or relevant authorities to take prompt actions in accordance with ETWB (2006) as appropriate. ’.

In Part 4 - Recommendations, item (g), line 4, delete ‘New Priority Classification System’ **and substitute** ‘New Priority Ranking System’; **In line 8, delete** ‘Landslip Preventive Measures Programme’ **and substitute** ‘Landslip Prevention and Mitigation Programme’.

In Part 6 - Preparation or Updating of Maintenance Manuals, item (a), line 5, delete ‘Landslip Preventive Measures Programme’ **and substitute** ‘Landslip Prevention and Mitigation Programme’.

In Part 7 - Design of Works (Optional Items), item (b), line 4, delete ‘WBTC No. 11/2000’ **and substitute** ‘ETWB TC(W) No. 13/2005’.

In Part 9 - Obtaining Checking Certificates for Stability Assessment of Slopes and Retaining walls (Optional Item), item (a), line 3, delete ‘WBTC No. 16/2001’ **and substitute** ‘ETWB TC(W) No. 20/2004’.

APPENDIX E**MODEL BRIEF FOR STABILITY ASSESSMENTS FOR
PRIVATE SLOPES OR RETAINING WALLS**

(ac) Section 1

In item (a), line 2, delete ‘requirements stipulated in the Geotechnical Manual for Slope (1984) or’.

In item (a), line 4, delete ‘Civil Engineering Department’ **and substitute** ‘Civil Engineering and Development Department’.

(ad) Section 3

In Part 1 – Basic Items, item (c), line 2, delete ‘requirements stipulated in the Geotechnical Manual for Slope (1984) or’.

(ae) Section 5

In line 6, delete ‘Civil Engineering Department web site at (<http://www.ced.gov.hk>)’ **and substitute** ‘Civil Engineering and Development Department web site at (<http://www.cedd.gov.hk>)’.

APPENDIX F**INDICATIVE RECORD SHEETS FOR
ENGINEER INSPECTIONS FOR MAINTENANCE**

(af) Sheet 4 of 10

Under the column ‘Items to be checked’, **add a new item** ‘Rock mesh netting & its anchorage points’.

(ag) Sheet 5 of 10

In the box ‘BURIED WATER-CARRYING SERVICES (including ducting systems and conduits)’, **the 4th to the 6th points and in the box** ‘GENERAL COMMENTS’, **the 8th point, add the following note:-**

Note: (1) These items apply only to those services belonging to the owner of or the party required to maintain the slope/retaining wall.

(ah) Sheet 7 of 10

In the box ‘OTHER RECOMMENDATIONS’, **under** ‘Frequency of Inspections (update Maintenance Manual if necessary)’, **the 3rd point, add the following note:-**

Note: (1) It applies only to those services belonging to the owner of or the party required to maintain the slope/retaining wall.

APPENDIX H**SAMPLE CHECK LIST FOR INFORMATION SEARCH
WHEN CONDUCTING ENGINEER INSPECTIONS FOR
MAINTENANCE**

(ai)

Under ‘Area and Site-specific Studies’, **delete** ‘Civil Engineering Department’ **and substitute** ‘Civil Engineering and Development Department’.

GLOSSARY OF TERMS

(aj)

Under ‘Maintenance Manual’, **add** ‘natural terrain hazard mitigation measure,’ **after** ‘.....maintenance requirements of a’.

RELATED DOCUMENTS

ETWB (2006). *Code of Practice on Monitoring and Maintenance of Water-Carrying Services Affecting Slopes. (Second edition)*. Environment, Transport and Works Bureau, Hong Kong, 93 p.

Lee, R.W.H., Leung, J.C.W. & Lo, D.O.K. (2015). *Review of Landslides in 2012 (GEO Report No. 312)*. Geotechnical Engineering Office, Hong Kong, 44 p.