

Geoguide 6 – Guide to Reinforced Fill Structure and Slope Design

First Edition

AMENDMENT NO.: GG6/01/2022

BACKGROUND

This amendment sheet incorporates updates of the latest revision of GEO Circular No. 17 – Reinforced Fill Products for Permanent Reinforced Fill Structures and Slopes, updates the references and fixes some minor typos.

The amendments are given below.

AMENDMENTS

FORWARD

FORWARD

In paragraph 1, line 3, delete ‘Geoguide 1 – Guide to Retaining Wall Design (1993)’ and substitute ‘Geoguide 1 – Guide to Retaining Wall Design (2020)’.

SECTION 1

INTRODUCTION

(a) Section 1.1

In paragraph 1, line 3, delete ‘Geoguide 1 – Guide to Retaining Wall Design (1993)’ and substitute ‘Geoguide 1 – Guide to Retaining Wall Design (2020)’.

SECTION 3

CONCEPTS AND PRINCIPLES OF REINFORCED FILL

(a) Section 3.4.2 (2)

In paragraph 3, line 7, delete ‘certificates’ and substitute ‘design data sheets’.

SECTION 4

CONSTRUCTION MATERIALS

(a) Section 4.1.2

In paragraph 1, line 3, delete ‘(BSI, 2004b)’ and substitute ‘(BSI, 2004c)’; delete ‘(BSI, 2004c)’ and substitute ‘(BSI, 2019c)’.

In paragraph 1, line 4, delete ‘(BSI, 2009c)’ and substitute ‘(BSI, 2016a)’.

In paragraph 1, line 5, delete ‘(BSI, 2009b)’ and substitute ‘(BSI, 2019d)’.

(b) Section 4.1.3

In paragraph 1, line 6, delete ‘(BSI, 2008a)’ and substitute ‘(BSI, 2015)’.

(c) Section 4.1.10

In paragraph 1, line 2, delete ‘(BSI, 2009b)’ and substitute ‘(BSI, 2019d)’.

(d) Section 4.2.1

In paragraph 2, line 2, delete ‘(BS EN 206-1 (BSI, 2000))’ and substitute ‘(BS EN 206 (BSI, 2021a))’.

In paragraph 2, line 3, delete ‘(BD, 2013)’ and substitute ‘(BD, 2020)’; delete ‘(BS EN 14475 (BSI, 2006b))’ and substitute ‘(BS EN 10025-1 (BSI, 2004c), BS EN 10025-2 (BSI, 2019c))’.

In paragraph 2, line 4, delete ‘(BD, 2011)’ and substitute ‘(BD, 2021)’.

- (e) Section 4.2.2 (1) **In paragraph 1, line 3, delete ‘(BS EN 206-1 (BSI, 2000))’ and substitute ‘(BS EN 206 (BSI, 2021a))’; delete ‘(BSI, 2012a)’ and substitute ‘(BSI, 2019a)’; delete ‘(BSI, 2012b)’ and substitute ‘(BSI, 2019b)’.**
- (f) Section 4.4.1 **In paragraph 1, line 3, delete ‘(GEO, 1993)’ and substitute ‘(GEO, 2020)’.**
- (g) Section 4.4.2 **In paragraph 1, line 4, delete ‘(GEO, 1993)’ and substitute ‘(GEO, 2020)’.**

SECTION 5 **INVESTIGATION AND TESTING**

- (a) Section 5.2 **In paragraph 1, line 2, delete ‘(GEO, 1987)’ and substitute ‘(GEO, 2017a)’.**

SECTION 6 **DESIGN CONSIDERATIONS**

- (a) Section 6.2.3(1) **In paragraph 2, line 1, delete ‘(GEO, 1993)’ and substitute ‘(GEO, 2020)’.**
- (b) Section 6.2.3(2) **In paragraph 1, line 2, delete ‘(GEO, 1993)’ and substitute ‘(GEO, 2020)’.**
In paragraph 2, line 2, delete ‘(GEO, 1993)’ and substitute ‘(GEO, 2020)’.
- (c) Section 6.5.3 (3) **In paragraph 3, line 3, delete ‘certified’ and substitute ‘accepted’.**
In paragraph 3, line 4, delete ‘certificates’ and substitute ‘design data sheets’.
In paragraph 3, line 5, delete ‘Civil Engineering Department’ and substitute ‘Civil Engineering and Development Department’.
- (d) Section 6.6.3 **In paragraph 2, line 1, delete ‘certified’ and substitute ‘accepted’.**
In paragraph 2, line 2, delete ‘certificates’ and substitute ‘design data sheets’.
In paragraph 2, line 3, delete ‘Civil Engineering Department’ and substitute ‘Civil Engineering and Development Department’.
- (e) Section 6.6.5 **In paragraph 1, line 3, delete ‘(GEO, 1993)’ and substitute ‘(GEO, 2020)’.**
- (f) Section 6.10 **In title, delete ‘Certification’ and substitute ‘Prior Acceptance’.**
In paragraph 2, line 1, delete ‘Civil Engineering Department’ and substitute ‘Civil Engineering and Development Department’.
In paragraph 2, line 1, delete ‘operates a certification system to’.
In paragraph 2, line 2, delete ‘regulate’ and substitute ‘regulates’.
In paragraph 2, line 3, add ‘through a product assessment and acceptance process’.
In paragraph 2, line 4, delete ‘certificates’ and substitute ‘design data sheets’.
In paragraph 2, line 5, delete ‘Civil Engineering Department’ and substitute ‘Civil Engineering and Development Department’.
- (g) Section 6.11 **In the last paragraph, line 2, delete ‘(GEO, 1993)’ and substitute ‘(GEO, 2020)’.**
- (h) Section 6.12 **In the last paragraph, line 2, delete ‘(GEO, 2003)’ and substitute ‘(GEO, 2021)’.**

SECTION 7 **DESIGN OF REINFORCED FILL STRUCTURES**

- (a) Section 7.4.2 **In paragraph 1, line 2, delete ‘(GEO, 1993)’ and substitute ‘(GEO, 2020)’.**
In paragraph 2, line 6, delete ‘(GEO, 1993)’ and substitute ‘(GEO, 2020)’.
In paragraph 3, line 5, delete ‘(GEO, 1993)’ and substitute ‘(GEO, 2020)’.
In paragraph 4, line 4, delete ‘(GEO, 1993)’ and substitute ‘(GEO, 2020)’.
- (b) Section 7.5.2 **In paragraph 5, line 2, delete ‘(GEO, 1993)’ and substitute ‘(GEO, 2020)’.**
- (c) Section 7.5.3 **In paragraph 3, line 4, delete ‘certificates’ and substitute ‘design data sheets’.**
- (d) Section 7.5.4 (2) **In paragraph 3, line 2, delete ‘certificates’ and substitute ‘design data sheets’.**
- (e) Section 7.11.1 **In paragraph 6, line 6, delete ‘(GEO, 1993)’ and substitute ‘(GEO, 2020)’.**

SECTION 9 **AESTHETICS AND LANDSCAPING**

- (a) Section 9.4 **In paragraph 1, line 2, delete ‘(GEO, 2003)’ and substitute ‘(GEO, 2021)’.**

SECTION 11 **CONSTRUCTION CONTROL**

- (a) Section 11.1 **In paragraph 4, line 3, delete ‘(GEO, 1993)’ and substitute ‘(GEO, 2020)’.**
- (b) Section 11.2.1 **In paragraph 3, line 6, delete ‘(GEO, 1993)’ and substitute ‘(GEO, 2020)’.**

TABLES

- (a) Table 6 **In Notes (3) and (4):**
Delete ‘certificates’ and substitute ‘design data sheets’.
Delete ‘Civil Engineering Department’ and substitute ‘Civil Engineering and Development Department’.

APPENDIX A

- (a) Clause A.11 **In title, delete ‘certificate’ and substitute ‘design data sheets’.**
In line 1, delete ‘Reinforced fill product certificate is a certificate’ and substitute ‘Reinforced fill product design data sheets are’.
In line 2, delete ‘Civil Engineering Department’ and substitute ‘Civil Engineering and Development Department’.
- (b) Clause A.12 (1)(a) **In line 1, delete ‘BS EN 206-1: 2000’ and substitute ‘BS EN 206: 2013 + A2: 2021’.**
In line 2, delete ‘BS 8500-1: 2006+A1: 2012’ and substitute ‘BS 8500-1: 2015 + A2: 2019’; delete ‘BS 8500-2: 2006+A1: 2012’ and substitute ‘BS 8500-2: 2015 + A2: 2019’.
- (c) Clause A.12(1)(b) **In line 3, delete ‘BS EN 10025-2: 2004’ and substitute ‘BS EN 10025-2: 2019’.**

- (d) Clause A.12(1)(c) **In line 2, delete ‘BS EN 10025-2: 2004’ and substitute ‘BS EN 10025-2: 2019’.**
- (e) Clause A.12(1)(e) **Delete ‘a reinforced fill product certificate’ and substitute ‘reinforced fill product design data sheets’.**
- (f) Clause A.13(1) **Delete ‘of’ and substitute ‘or’.**
- (g) Clause A.13(1)(a) **In line 3, delete ‘BS EN 10025-2: 2004’ and substitute ‘BS EN 10025-2: 2019’.**
- (h) Clause A.13(1)(b) **In line 2, delete ‘a reinforced fill product certificate’ and substitute ‘reinforced fill product design data sheets’.**
In line 3, delete ‘Civil Engineering Department’ and substitute ‘Civil Engineering and Development Department’.
- (i) Clause A.13(2)(a) **In line 2, delete ‘BS.3692: 2001’ and substitute ‘BS 3692: 2014’.**
- (j) Clause A.13(2)(b) **In line 2, delete ‘BS 4190: 2001’ and substitute ‘BS 4190: 2014’.**
- (k) Clause A.13(2)(d) **In line 3, delete ‘BS EN 10025-2: 2004’ and substitute ‘BS EN 10025-2: 2019’.**
- (l) Clause A.13(2)(e) **In line 3, delete ‘BS EN 10025-2: 2004’ and substitute ‘BS EN 10025-2: 2019’.**
- (m) Clause A.13(2)(f) **In line 1, delete ‘a reinforced fill product certificate’ and substitute ‘reinforced fill product design data sheets’.**
- (n) Clause A.15(6) **In line 2, delete ‘certificate’ and substitute ‘design data sheets’.**
- (o) Clause A.16(2) **In line 3, delete ‘certificate’ and substitute ‘design data sheets’.**
- (p) Table A.1 **In Notes (2):**
Delete ‘BS 410-1: 2000, ISO 3310-1: 2000’ and substitute ‘BS ISO 3310-1: 2016’.
- (q) Table A.2 **In Notes (4):**
Delete ‘BS 410-1: 2000, ISO 3310-1: 2000’ and substitute ‘BS ISO 3310-1: 2016’.
- (r) Clause A.19(1)(c) **In line 3, delete ‘certificate’ and substitute ‘design data sheets’.**
- (s) Clause A.34(2) **In line 2, delete ‘repair’ and substitute ‘repaired’.**
- (t) Clause A.40(1) **In line 3, delete ‘BS EN ISO 6892-1: 2009’ and substitute ‘BS EN ISO 6892-1: 2019’.**
- (u) Clause A.40(2) **In line 2, delete ‘BS EN ISO 10319:2008’ and substitute ‘BS EN ISO 10319:2015’.**
- (v) Clause A.41(a) **In line 1, add ‘value’.**
In line 2, delete ‘requirements for the parent reinforcing element’ and substitute ‘in the manufacturer certification or as specified by the Engineer’.
- (w) Clause A.49(m) **In line 2, delete ‘certificate’ and substitute ‘design data sheets’.**
- (x) Clause A.50(e) **In line 2, delete ‘certificate’ and substitute ‘design data sheets’.**

- (y) Clause A.52 **In line 2, delete ‘BS 1377: Part 3: 1990, test 10.4’ and substitute ‘BS 1377-3: 2018+A1: 2021, test 13.4’.**
- (z) Clause A.54 **In line 2, delete ‘BS 1377: Part 3: 1990, test 11’ and substitute ‘BS 1377-3: 2018 + A1: 2021, test 14’.**
- (aa) Clause A.62 **In line 2, delete ‘prEN13738’ and substitute ‘BS EN 13738: 2004’.**

APPENDIX B

- (a) Activities No. 1.5 **In line 2, delete ‘certificate’ and substitute ‘design data sheets’.**
- (b) Activities No. 2.5 **In line 2, delete ‘certificate’ and substitute ‘design data sheets’.**

GLOSSARY OF TERMS

- (a) Reinforced fill product certificate **In title, delete ‘certificate’ and substitute ‘design data sheets’.**
In line 1, delete ‘certificate’ and substitute ‘document’.
In line 1, delete ‘Civil Engineering Department’ and substitute ‘Civil Engineering and Development Department’.

REFERENCES

- (a) **Add the following new references:**
- BSI (2004b). *Geotextiles and geotextile-related products - Determination of pullout resistance in soil (BS EN 13738:2004)*. British Standards Institution, London, 18p.
- (b) **Delete the following references:**
- BSI (1990). *Methods of Test for Soils for Civil Engineering Purposes. General Requirements and Sample Preparation (BS 1377: Part 1 : 1990)*. British Standards Institution, London.
- BSI (1999). *Hot Dip Galvanized Coatings on Fabricated Iron and Steel Articles. Specifications and Test Methods (BS EN ISO 146 : 1999)*. British Standards Institution, London.
- BSI (1999). *Cold-Rolled Low-carbon Steel Flat Products for Cold Forming. Technical Delivery Conditions (BS EN 10130: 1999)*. British Standards Institution, London.
- BSI (2002). *Execution of Special Geotechnical Works – Reinforced Fill (Draft for public comment) (prEN 14475)*. British Standards Institution, London.
- BSI (2006b). *Execution of Special Geotechnical Works - Reinforced Fill (BS EN 14475:2006)*. British Standards Institution, London, 60 p.

(c) **Update the following reference:**

‘BD (2011). *Code of Practice for the Structural Use of Steel*. Buildings Department, Hong Kong, 366 p.’ **is updated to** ‘BD (2021). *Code of Practice for the Structural Use of Steel* (revision: August 2021). Buildings Department, Hong Kong, 367 p.’

‘BD (2013). *Code of Practice for Structural Use of Concrete*. Buildings Department, Hong Kong, 191 p.’ **is updated to** ‘BD (2020). *Code of Practice for Structural Use of Concrete* (revision: December 2020). Buildings Department, Hong Kong, 198 p.’

‘BSI (1990). *Methods of Test for Soils for Civil Engineering Purposes. Chemical and Electro-Chemical Tests (BS 1377: Part 3: 1990)*. British Standards Institution, London.’ **is updated to** ‘BSI (2021b). *Methods of Test for Soils for Civil Engineering Purposes. Chemical and Electro-Chemical Tests (BS 1377-3: 2018 + A1: 2021)*. British Standards Institution, London.’

‘BSI (2000). *Concrete -Part 1: Specification, Performance, Production and Conformity (BSEN 206-1:2000)*. British Standards Institution, London, 74 p.’ **is updated to** ‘BSI (2021a). *Concrete - Part 1: Specification, Performance, Production and Conformity (BS EN 206: 2013 + A2: 2021)*. British Standards Institution, London, 74 p.’

‘BSI (2000). *Test Sieves. Technical Requirements and Testing. Test Sieves of Metal Wire Cloth (BS 410-1:2000, ISO 3310-1:2000)*. British Standards Institution, London.’ **is updated to** ‘BSI (2016b). *Test Sieves. Technical Requirements and Testing. Test Sieves of Metal Wire Cloth (BS ISO 3310-1: 2016)*. British Standards Institution, London.’

‘BSI (2001). *ISO Metric Precision Hexagon Bolts, Screws and Nuts. Specification (BS 3692 : 2001)*. British Standards Institution, London.’ **is updated to** ‘BSI (2014a). *ISO Metric Precision Hexagon Bolts, Screws and Nuts. Specification (BS 3692: 2014)*. British Standards Institution, London.’

‘BSI (2001). *ISO Metric Black Hexagon Bolts, Screws and Nuts. Specification (BS 4190 : 2001)*. British Standards Institution, London.’ **is updated to** ‘BSI (2014b). *ISO Metric Black Hexagon Bolts, Screws and Nuts. Specification (BS 4190: 2014)*. British Standards Institution, London.’

‘BSI (2004b). *Hot Rolled Products of Structural Steels - Part 1: General Technical Delivery Conditions (BS EN 10025-1:2004)*. British Standards Institution, London, 36 p.’ **is updated to** ‘BSI (2004c). *Hot Rolled Products of Structural Steels - Part 1: General Technical Delivery Conditions (BS EN 10025-1:2004)*. British Standards Institution, London, 36 p.’

‘BSI (2004c). *Hot Rolled Products of Structural Steels -Part 2: Technical Delivery Conditions for Non-Alloy Structural Steels (BS EN 10025-2:2004)*. British Standards Institution, London, 38 p.’ **updated to** ‘BSI (2019c). *Hot Rolled Products of Structural Steels - Part 2: Technical Delivery Conditions for Non-Alloy Structural Steels (BS EN 10025-2: 2019)*. British Standards Institution, London, 38 p.’

‘BSI (2006a). *Cold Rolled Low Carbon Steel Flat Products for Cold Forming – Technical Delivery Conditions (BS EN 10130:2006)*. British Standards Institution, London, 16 p.’ **is updated to** ‘BSI (2006). *Cold Rolled Low Carbon Steel Flat Products for Cold Forming – Technical Delivery Conditions (BS EN 10130:2006)*. British Standards Institution, London, 16 p.’

‘BSI (2008a). *Geosynthetics -Wide-width Tensile Test (ISO 10319:2008) (BS EN ISO10319:2008)*. British Standards Institution, London, 18 p.’ **is updated to** ‘BSI (2015). *Geosynthetics - Wide-width Tensile Test (ISO 10319: 2008) (BS EN ISO 10319: 2015)*. British Standards Institution, London, 18 p.’

‘BSI (2008b). *Geosynthetics -Tensile Test for Joints/Seams by Wide-width Strip Method (ISO 10321:2008) (BS EN ISO 10321:2008)*. British Standards Institution, London, 20 p.’ **is updated to** ‘BSI (2008). *Geosynthetics - Tensile Test for Joints/Seams by Wide-width Strip Method (ISO 10321:2008) (BS EN ISO 10321:2008)*. British Standards Institution, London, 20 p.’

‘BSI (2009a). *Hot Dip Galvanized Coatings on Fabricated Iron and Steel Articles-Specifications and Test Methods (ISO 1461:2009) (BS EN ISO 1461:2009)*. British Standards Institution, London, 24 p.’ **is updated to** ‘BSI (2009). *Hot Dip Galvanized Coatings on Fabricated Iron and Steel Articles - Specifications and Test Methods (ISO 1461:2009) (BS EN ISO 1461:2009)*. British Standards Institution, London, 24 p.’

‘BSI (2009b). *Metallic Materials -Tensile Testing, Part 1: Method of Test at Ambient Temperature (BS EN ISO 6892-1:2009)*. British Standards Institution, London, 76 p.’ **is updated to** ‘BSI (2019d). *Metallic Materials - Tensile Testing, Part 1: Method of Test at Ambient Temperature (BS EN ISO 6892-1: 2019)*. British Standards Institution, London, 76 p.’

‘BSI (2009c). *Steel for the Reinforcement of Concrete -Weldable Reinforcing Steel -Bar, Coil and Decoiled product -Specification (BS 4449:2005+A2:2009)*. British Standards Institution, London, 34 p.’ **is updated to** ‘BSI (2016a). *Steel for the Reinforcement of Concrete - Weldable Reinforcing Steel - Bar, Coil and Decoiled product - Specification (BS 4449: 2005+A3: 2016)*. British Standards Institution, London, 34 p.’

‘BSI (2012a). *Concrete -Complementary British Standard to BS EN 206-1 - Part 1: Method of Specifying and Guidance for the Specifier (BS 8500-1:2006+A1:2012)*. British Standards Institution, London, 66 p.’ **is updated to** ‘BSI (2019a). *Concrete - Complementary British Standard to BS EN 206-1 - Part 1: Method of Specifying and Guidance for the Specifier (BS 8500-1: 2015 +A2: 2019)*. British Standards Institution, London, 66 p.’

‘BSI (2012b). *Concrete - Complementary British Standard to BS EN 206-1 - Part 2: Specification for Constituent Materials and Concrete (BS 8500-2:2006+A1:2012)*. British Standards Institution, London, 52 p.’ **is updated to** ‘BSI (2019b). *Concrete - Complementary British Standard to BS EN 206-1 - Part 2: Specification for Constituent Materials and Concrete (BS 8500-2: 2015 +A2: 2019)*. British Standards Institution, London, 52 p.’

‘GEO (1984). *Geotechnical Manual for Slopes. (Second edition)*. Geotechnical Engineering Office, Hong Kong.’ **is updated to** ‘GEO (1984). *Geotechnical Manual for Slopes (Second edition)*. Geotechnical Engineering Office, Civil Engineering and Development Department, HKSAR Government, 302 p.’

‘GEO (1987). *Guide to Site Investigation (Geoguide 2)*. Geotechnical Control Office, 368p. (Reprinted 1993).’ **is updated to** ‘GEO (2017a). *Guide to Site Investigation (Geoguide 2) (Continuously Updated E-Version Released on 18 December 2017)*. Geotechnical Engineering Office, Civil Engineering and Development Department, HKSAR Government, 349 p.’

‘GEO (1993). *Guide to Retaining Wall Design (Geoguide 1)*. Geotechnical Engineering Office, Hong Kong.’ **is updated to** ‘GEO (2020). *Guide to Retaining Wall Design (Geoguide 1) (Continuously Updated E-version Released on 1 June 2020)*. Geotechnical Engineering Office, Civil Engineering and Development Department, HKSAR Government, 245 p.’

‘GEO (2001). *Model Specification for Soil Testing (Geospec3)*. Geotechnical Engineering Office, Hong Kong, 340 p.’ **is updated to** ‘GEO (2017b). *Model Specification for Soil Testing (Geospec 3) (Continuously Updated E-Version Released on 29 August 2017)*. Geotechnical Engineering Office, Civil Engineering and Development Department, HKSAR Government, 324 p.’

‘GEO (2003). *Guide to Slope Maintenance (Geoguide 5). (Third edition)*. Geotechnical Engineering Office, Hong Kong, 132 p.’ **is updated to** ‘GEO (2021). *Guide to Slope Maintenance (Geoguide 5, Third Edition) (Continuously Updated E-version Released on 25 November 2021)*. Geotechnical Engineering Office, Civil Engineering and Development Department, HKSAR Government, 122 p.’

‘HKSARG (2012). *Construction Standard, Steel Reinforcing Bars for the Reinforcement of Concrete (CS2:2012)*. The Government of the Hong Kong Special Administrative Region, Hong Kong, 50 p.’ **is updated to** ‘HKSARG (2018). *Construction Standard, Steel Reinforcing Bars for the Reinforcement of Concrete (CS2:2012) (Continuously Updated E-version Released on 26 September 2018)*. HKSAR Government, 53 p.’