



**HIGHWAYS &
STREETSCENE
HIGHWAYS STRUCTURES**

**Flint Street,
Fartown,
Huddersfield
HD1 6LG**

APPROVAL IN PRINCIPLE FOR DESIGN OF

***Proposed modifications to private
embankment supporting new highway
at Broad Oak, Linthwaite.***

Structure reference: K66646
Date: 03.12.24
Revision: 3
Status: Final
Prepared by: Adam Cash
Checked by: Gordon Mackenzie

Information is available in large print, braille,
audio tape, or PC disk on request

Scheme title: Broad Oak, Linthwaite
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DOCUMENT CONTROL

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Document issue record

Issue	Status	Prepared	Date	Checked	Date	Approved	Date
0	Draft	AC	28/10/24	GM	28/10/23		
1	Draft	AC	12/11/24	GM	12/11/24		
2	Final	AC	27/11/24	GM	27/11/24		
3	Final	AC	03/12/24	GM	03/12/24		

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PROJECT DETAILS

Name of project: Broad Oak, Linthwaite

Name of Bridge or Structure: Private embankment supporting new highway

Structure reference no: K66646

Summary:

The Green Terramesh Reinforced earth slope is required to support part of the embankment surrounding the SUD's pond below the access road (Road 1) North of the site. The reason for installing the Green Terramesh Reinforced Slope is to achieve a 1V:3H gradient across the span of the slope below the road as some areas are steeper than this, and therefore requires AIP.

1. HIGHWAY DETAILS

1.1. Type of highway

1.1.1. Location and OS Map / Grid reference

Location: Kinder Avenue, Cowlersley, Kirklees, West
Yorkshire, England, HD4 5XD, United

OS Map: SE 10615 14725

Grid Ref (X, Y): 410615 , 414725

1.2. Permitted traffic speed

30mph

1.3. Existing restrictions

None

2. SITE DETAILS

2.1. Obstacles retained

The Green Terramesh reinforced earth slope is required to support part of the embankment surrounding the SUD's pond below the access road to reduce the gradient of the slope to the required 1V:3H slope.

3. PROPOSED STRUCTURE

3.1. Description of structure and design working life

The structure is composed of a Green Terramesh reinforced earth slope that is located north of the site supporting part of the embankment surrounding the SUD's pond below the access road of the Broad Oak, Linthwaite development.

The maximum total height of the Green Terramesh structure will be 1.52m (two units) with a total maximum height of 4.25m including the regraded 1V:3H embankment above.

The structure requires a design working life category of 5 (i.e. >120 years) in accordance with BS EN1990:2002 NA.

Construction of the Green Terramesh earth slope is to be in accordance with the manufacturer's installation instructions.

Design details of the wall is shown on Geoman drawing numbers SK22-5482-P11-01 (REVB), SK22-5482-P11-02 (REVB) & SK22-5482-P11-03 (REVB).

3.2. Structural type

Green Terramesh reinforced earth slope.

3.3. Foundation type

The Green Terramesh unit does not require a formal foundation but will be placed on a minimum 150mm deep layer of Class 6l granular fill on SANDTONE BEDROCK (HUDDERSFIELD WHITE ROCK FORMATION) with a minimum allowable bearing capacity of 150kN/m².

3.4. Span arrangements

The maximum height of the Green Terramesh structure will be 1.52m (two units) with a total maximum height of 4.25m including the regraded 1V:3H embankment above. The units will be used where necessary (areas that are steeper than 1V:3H).

3.5. Articulation arrangements

N/A – reinforced slope

3.6. Classes and levels

3.6.1. Consequence class

CC2 (UK NA to BS EN 1990:2002+A1:2005)

3.6.2. Reliability class

RC2 (UK NA to BS EN 1990:2002+A1:2005)

3.6.3. Inspection level

IL2 (UK NA to BS EN 1990:2002+A1:2005)

3.7. Road restraint systems requirements

It is proposed to install a 1.15m high post and rail fence at the top of the embankment with an M2 guardrail 2.0m away towards the road. A trief kerb will be installed at the verge of the road 0.5m away from the M2 guardrail. Horizontal loads considered in accordance with the National Annex of Eurocode 1 [2014].

A minimum 1.15m high post and rail fence is to be installed at the crest of the GTM slope. The posts are to be fully concreted into minimum 0.7m deep, 0.3m diameter void formers pre-installed into the backfill of the upper GTM unit during construction.

3.8. Proposed arrangements for future maintenance and inspection

3.8.1. Traffic management

None required for inspection. The road closure may be required for future maintenance. This should be agreed with Kirklees Council.

3.8.2. Arrangements for future maintenance and inspection of structure. Access arrangements to structure.

The Green Terramesh reinforced earth slope can be inspected from above or at the toe of the wall.

3.9. Environment and sustainability

The slope has been designed and specified with sustainability in mind:

- The number of Green Terramesh units is low due to the structure height and therefore allows for quicker construction.
- No concrete is required for the system only crushed stone (imported 6l granular material compliant with Class 6l granular fill to be used)
- The “green face” allows for a natural look which blends seamlessly into the embankment.

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3.10. Durability. Materials and finishes

Item	Material	Finish / Location
Green Terramesh unit	3mx2mx0.76m Green Terramesh Units (face angle = max 70°). Green Terramesh Light units shall be heavily galvanized with Galmac (Zn-5%Al alloy) in compliance with EN 10244-2. Approx. 300mm specified selected bagged topsoil, placed and lightly tamped in. Steel wire mesh of Light Green Terramesh has a minimum tensile strength of 35kN/m, test carried out according to EN10223-3:2013.	The face of the structure will be hydroseeded to achieve a "green face". See SK22-5482-P11-01 (REVB), -02 (REVB) & -03 (REVB) for details.
Compacted granular fill	Compacted granular fill material which complies with Class 6I.	To be used as the levelling pad for the Green Terramesh and as the backfill to the Green Terramesh units, as well as partially making up the embankment above.
Pedestrian rail at the top of the Green Terramesh Units	A minimum 1.15m high post and rail fence is to be installed at the crest of the GTM slope. The posts are to be fully concreted into minimum 0.7m deep, 0.3m diameter void formers pre-installed into the backfill of the upper GTM unit during construction.	Timber post and rail fence (DMRB H15) located behind crest of GTM slope

3.11. Risks and hazards considered for design, execution, maintenance and demolition. Consultation with and/or agreement from Overseeing Organisation

Geoman Ltd. conducted the design of the structure and, as designers, are responsible for fulfilling their obligations as defined in the Construction (Design & Management) Regulations 2015.

Casey Group Ltd is the Principal Contractor

TADW Architects is the Principal Designer

Designers Risks have been identified and are included in the Appendix.

3.12. Estimated cost of proposed structure together with other structural forms considered (including where appropriate proprietary manufactured structure), and the reasons for their rejection (including comparative whole life costs with dates of estimates).

Approximately £10,000. Other solutions were also considered, but were deemed unsuitable due to aesthetics, and costs.

3.13. Proposed arrangements for construction

3.13.1. Construction of structure

A safe method of construction will be developed by the contractor based on the following points:

- Existing bank to be regraded to allow safe access for excavator.
- Base unit Green Terramesh to be installed.
- On completion, overall slope to be regraded

3.13.2. Traffic management

N/A

3.13.3. Service diversions

N/A

3.13.4. Interface with existing structures

N/A

3.14. Resilience and security

The Green Terramesh reinforced earth slope is at very little risk of damage from vandals and given the location of the structure (surrounding a SUDs pond). The structure is also protected by two barriers at the crest of the embankment and when the face greens up (through the use of hydroseeding) it will blend into the embankment.

4. DESIGN CRITERIA

4.1. Actions

4.1.1. Permanent actions

The structure has been designed for lateral earth pressures based on conservative soil properties. A maximum height of 4.25m (including the embankment) was considered in the design. Other permanent actions from the self-weight of the structure have also been considered.

All permanent actions as outlined in BS EN 1991-1-1 and the national annex:

6l granular backfill = 19kN/m^3 in accordance with BS EN 1991 Actions on Structures.

Loading will be applied and combined in accordance with BS EN 1990 and BS EN 1991 as amended by the relevant national annex and BS EN 1997-1:2004+A1:2013 and NA to BS EN 1997-1:2004+A1:2013 for both ULS and SLS.

4.1.2. Snow, Wind and Thermal actions

Snow loads to BS EN 1991-1-3:2003+A1:2015 and NA + A2:18 to BS EN 1991-1-3:2003+A1:2015

Wind loads to BS EN 1991-1-4:2005+A1:2010

Thermal actions to BS EN 1991-1-5:2003

4.1.3. Actions relating to normal traffic under AW regulations and C&U regulations

N/A

4.1.4. Actions relating to General Order traffic under STGO regulations

N/A

4.1.5. Footway or footbridge variable actions

10kN/m^2 surcharge assumed to act on the footpath and road at the top of the embankment BS EN 1991-2 and BS8002:2015

4.1.6. Actions relating to Special Order traffic, provision for exceptional abnormal indivisible loads including location of vehicle track on deck cross-section

N/A

4.1.7. Accidental actions

Accidental impact load from vehicle considered in accordance with BS 6779-4 and Eurocode 1-1.7.

4.1.8. Action during construction

Geotechnical actions and construction loads to be in accordance with 4.3, 4.7 and 4.1.1 of BS EN 1991-1-6 and NA to BS EN 1991-1-6.

4.1.9. Any special action not covered above

N/A

4.2. Heavy or high load route requirements and arrangements being made to preserve the route, including any provision for future heavier loads or future widening

N/A

4.3. Proposed minimum headroom provided

N/A

4.4. Authorities consulted and any special conditions required

Kirklees Council

4.5. Standards and documents listed in the Technical Approval Schedule

TAS dated 28/10/24 See appendix A.

Additional relevant DoT standards published since the above edition of the TAS including amendments, are listed as follows:

None

4.6. Proposed departures from standards listed in 4.5

N/A

4.7. Proposed departures from standards concerning methods for dealing with aspects not covered by standards listed in 4.5

The new embankment is a private structure and as such its maintenance responsibility will be transferred to a management company. A copy of the agreement will be submitted to Kirklees Council for their records.

4.8. Proposed safety critical fixings

N/A

5. STRUCTURAL ANALYSIS

5.1. Methods of analysis proposed for superstructure, substructure and foundations

The slope has been analysed using a method of analysis in line with BS EN 1997-1:2004 and BS 8006-1:2010. The lateral earth pressures (active and at-rest) and live load surcharge was applied to the wall which has been designed as a vertical wall in accordance with BS EN 1997-1:2004+A1:2013 and NA to BS EN 1997-1:2004+A1:2013.

5.2. Description and diagram of idealised structure to be used for analysis

The effects of permanent and variable actions will be analysed using Maccaferri's MacStARS W Analysis software. The analysis of the wall will be carried using a metre strip method assuming worse case height of the wall/structure of 4.25m (including embankment). The wall/structure will be subjected to earth and surcharge loads described in 4.1.

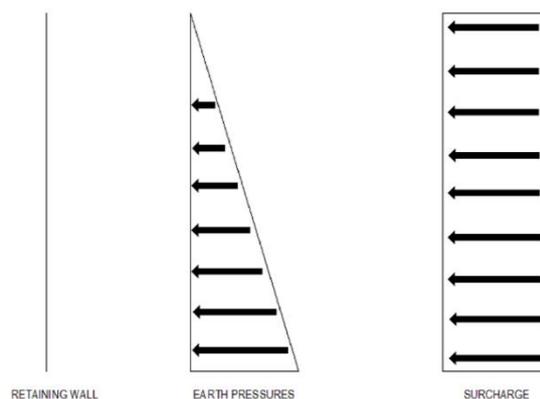


Figure 1 –Idealised structure to be used for analysis

5.3. Assumptions intended for calculation of structural element stiffness

- Weight of 6l backfill is 19kN/m³.
- Surcharge is taken as 10kN/m² on the road which satisfies BS EN 1991-2 and BS8002:2015.

5.4. Proposed range of soil parameters to be used in the design of earth retaining elements

- The foundation material (in-situ) to be SANDSTONE BEDROCK (HUDDERSFIELD WHITE ROCK FORMATION) with minimum: $\phi' = 32^\circ$ $K_a = 0.31$ $K_p = 3.26$ $K_o = 0.47$
- The retained material is to be medium dense to dense silty sandy GRAVEL (WEATHERED HUDDERSFIELD WHITE ROCK FORMATION) with a minimum: $\phi' = 30^\circ$ $K_a = 0.33$ $K_o = 0.50$

6. GEOTECHNICAL CONDITIONS

6.1. Acceptance of recommendations of the ground investigation report (references/dates) to be used in the design and reasons for any proposed changes

GRM Phase II Site Appraisal (Desk Study) (Report P8985, May 2020) includes several window samples and trial pits excavated across the site in the vicinity of the proposed reinforced slope. The most relevant log was TP09.

Considering the proposed cut and fill works the logs generally indicate that formation level of the walls will be original, competent SANDSTONE BEDROCK (HUDDERSFIELD WHITE ROCK FORMATION). A conservative minimum effective angle of internal friction of 32 degrees was assumed for original, competent BEDROCK (HUDDERSFIELD WHITE ROCK FORMATION) based on the Plasticity Index result 19% (NAVFAC 1971). We have assumed the walls retained stratum will be medium dense to dense silty sandy GRAVEL (WEATHERED HUDDERSFIELD WHITE ROCK FORMATION) with a minimum friction angle of 30.

The Principal Contractor appointed a local geotechnical specialist to inspect and test the ground at proposed formation level and below to ensure a minimum required safe bearing resistance of 150kPa is achieved. The hand shear vane test results were satisfactory in achieving the bearing capacity requirements. We were assured any soft/loose or unsuitable material (such as made ground, soft clay, loose sand, alluvium or peat/ organics) present at or below formation level was excavated out down to original, competent SANDSTONE BEDROCK (HUDDERSFIELD WHITE ROCK FORMATION) and replaced with compacted Class 6F2 granular fill.

6.2. Summary of design for highway structure in the ground investigation report

See Highway Structure Summary Information Sheet attached in Appendix. Design Sulphate Class for the site should be taken as DS-1 and the ACEC Class as AC-1.

6.3. Differential settlement to be allowed for in the design of the structure

10mm over 10m.

6.4. If the ground investigation report is not yet available, state when the results are expected and list the sources of information used to justify the preliminary choice of foundations

N/A

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7. CHECK

7.1. Proposed Category and Design Supervision Level

DMRB, CG 300, Cl. 3.8.3 indicates Category 1 (Retaining greater than 2.5m but less than 7m).

7.2. If Category 3, name of proposed Independent Checker

N/A.

7.3. Erection proposals or temporary works for which Types S and P Proposals will be required, listing structural parts of the permanent structure affected with reasons

The safe angle of repose of the temporary cut slope is to be determined on site. Battering of the temporary cut slope may be required to create a safe working environment.

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8. DRAWINGS AND DOCUMENTS

8.1. List of drawings (including numbers) and documents accompanying the submission

8.1.1. Drawings (See appendix B)

Reference	Title
Geoman drawing SK22-5482-P11-00 Rev 0	SITE LOCATION PLAN
Geoman drawing SK22-5482-P11-01 Rev B	PROPOSED GTM SLOPE DETAILS (PLAN AND SECTION A-A)
Geoman drawing SK22-5482-P11-02 Rev B	PROPOSED GTM SLOPE DETAILS (SECTIONS B-B AND C-C)
Geoman drawing SK22-5482-P11-03 Rev B	PROPOSED GTM SLOPE DETAILS (SECTIONS D-D AND E-E)
TADW Architects drawing 911277 101C13 Overall Proposed Site Plan Rev C13	Proposed Site Plan

8.1.2. Documents (See appendix C)

Reference	Title
GRM Report P8985	LAND OFF CHURCH LANE, LINTHWAITE PHASE II SITE APPRAISAL FOR CASEY GROUP LTD – BY GRM (MAY 2020)

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9. THE ABOVE IS SUBMITTED FOR ACCEPTANCE

Design Team Leader

Signed



Name

Adam Cash

Engineering Qualifications

BEng (Hons)

Name of Organisation

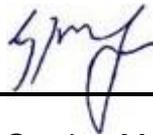
Geoman Ltd.

Date

03.12.24

Check Team Leader

Signed



Name

Gordon Mackenzie

Engineering Qualifications

CEng MICE

Name of Organisation

Geoman Ltd.

Date

03.12.24

10. THE ABOVE IS REJECTED/AGREED SUBJECT TO THE AMENDMENTS AND CONDITIONS SHOWN BELOW (*)

Signed



Name

Farhad Khatibi

Position held

Bridges & Structures Manager

Engineering Qualifications

BSc (Hons) Civil Eng, MSc

TAA

Kirklees Council

Date

04/12/2024

For and on behalf of Kirklees Council

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(*)

- (i) Submission of satisfactory structural calculations for the design of new Reinforced earth slope wall in compliance with the design parameters in the agreed AIP Rev 03.
 - (ii) Submission of satisfactory “Design and Check Certificate” (Category 1) in compliance with the agreed AIP Rev 03 for the new Reinforced earth slope wall.
 - (iii) Submission of “Construction Compliance Certificate” and “As Built” drawings in accordance with CG 300- Technical approval of highway structures, upon the completion of works.
-

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APPENDIX A

LIST OF RELEVANT DESIGN DOCUMENTS

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TECHNICAL APPROVAL SCHEDULE (TAS)

Schedule of Documents Relating to Design of Highway Bridges and Structures

(All documents are taken to include revisions current as of November 2021)

The Designer is responsible for ensuring that the standards and references given in the schedule are correct and up to date. [Tick all the documents used](#) (✓)

Eurocodes and associated UK National Annexes				
Used	Reference	Title	Amendment / Corrigenda	Notes
	Eurocode 0	Basis of structural design		
✓	BS EN 1990:2002 +A1:2005	Eurocode 0: Basis of structural design	+A1:2005 Incorporating corrigenda December 2008 and April 2010	See CD 350 section 7 for additional guidance.
✓	NA to BS EN 1990:2002 + A1:2005	UK National Annex to Eurocode 0 Basis of structural design	National Amendment No.1	See CD 350 section 7 for additional guidance.
	Eurocode 1	Actions on structures		
✓	BS EN 1991-1-1:2002	Eurocode 1: Actions on structures. General Actions. Densities, self-weight, imposed load for buildings	Corrigenda December 2004 and March 2009	
✓	NA to BS EN 1991-1-1:2002	UK National Annex to Eurocode 1: Actions on structures. General Actions. Densities, self-weight, imposed load for buildings	Corrigenda July 2019	
✓	BS EN 1991-1-3:2003 +A1:2015	Eurocode 1: Actions on structures. General Actions. Snow loads	+A1:2015 Incorporating corrigenda December 2004 and March 2009	
✓	NA to BS EN 1991-1-3:2003+A1:2015	UK National Annex to Eurocode 1: Actions on structures. General Actions. Snow loads	+A2:2018 Incorporating corrigenda June 2007, December 2015 and October 2018	
✓	BS EN 1991-1-4:2005 +A1:2010	Eurocode 1: Actions on structures. General Actions. Wind actions	+A1:2010 Corrigenda July 2009 and January 2010	
✓	NA to BS EN 1991-1-4:2005 + A1:2010	UK National Annex to Eurocode 1: Actions on structures. General Actions. Wind actions	National Amendment No.1	
✓	BS EN 1991-1-5:2003	Eurocode 1: Actions on structures. General Actions. Thermal actions	Corrigenda December 2004 and March 2009	
✓	NA to BS EN 1991-1-5:2003	UK National Annex to Eurocode 1: Actions on structures. General Actions. Thermal actions	-	
✓	BS EN 1991-1-6:2005	Eurocode 1: Actions on structures. General Actions. Actions during execution	Corrigenda July 2008, November 2012 and February 2013	

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Eurocodes and associated UK National Annexes				
Used	Reference	Title	Amendment / Corrigenda	Notes
✓	NA to BS EN 1991-1-6:2005	UK National Annex to Eurocode 1: Actions on structures. General Actions. Actions during execution	-	
	BS EN 1991-1-7:2006 +A1:2014	Eurocode 1: Actions on structures. General Actions. Accidental actions	+A1: 2014 Corrigendum February 2010	
	NA+A1 to BS EN 1991-1-7:2006+A1:2014	UK National Annex to Eurocode 1: Actions on structures. Part 1-7 : Accidental actions	+A1:2014 Incorporating corrigenda August 2014 and November 2015	See CD 350 for additional guidance.
✓	BS EN 1991-2:2003	Eurocode 1: Actions on structures. Traffic loads on bridges	Corrigenda December 2004 and February 2010	See CD 350 section 7 for additional guidance.
	NA +A1:2020 to BS EN 1991-2:2003	UK National Annex to Eurocode 1: Actions on structures. Traffic loads on bridges	Corrigendum No.1 Amendment June 2020	See CD 350 section 7 for additional guidance.
	<i>Eurocode 2</i>	<i>Design of concrete structures</i>		
	BS EN 1992-1-1:2004 + A1:2014	Eurocode 2: Design of concrete structures– Part 1-1: General rules and rules for buildings	Incorporating corrigendum January 2008, November 2010 and January 2014	
	NA + A2:2014 to BS EN 1992-1-1:2004 + A1:2014	UK National Annex to Eurocode 2: Design of concrete structures – Part 1-1: General rules and rules for buildings		
	BS EN 1992-2:2005	Eurocode 2: Design of concrete structures – Part 2: Concrete bridges – Design and detailing rules	Corrigendum July 2008	
	NA to BS EN 1992-2:2005	UK National Annex to Eurocode 2: Design of concrete structure – Part 2: Concrete bridges – Design and detailing rules	-	
	BS EN 1992-3:2006	Eurocode 2: Design of concrete structures – Part 3: Liquid retaining and containment structures	-	
	NA to BS EN 1992-3:2006	UK National Annex to Eurocode 2: Design of concrete structures – Part 3: Liquid retaining and containment structures	-	
	BS EN 1992-4:2018	Eurocode 2: Design of concrete structures – Part 4: Design of fastenings for use in concrete		
	NA to BS EN 1992-4:2018	UK National Annex to Eurocode 2: Design of concrete structures – Part 4: Design of fastenings for use in concrete		
	<i>Eurocode 3</i>	<i>Design of steel structures</i>		
	BS EN 1993-1-1:2005 + A1:2014	Eurocode 3: Design of steel structures – Part 1-1 General rules and rules for buildings	Corrigenda February 2006 and April 2009	
	NA + A1:2014 to BS EN 1993-1-1:2005 + A1:2014	UK National Annex to Eurocode 3: Design of steel structures – Part 1-1 General rules and rules for buildings	-	
	BS EN 1993-1-3:2006	Eurocode 3: Design of steel structures – Part 1-3 General rules – Supplementary rules for cold-formed members and sheeting	Corrigendum November 2009	

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Eurocodes and associated UK National Annexes				
Used	Reference	Title	Amendment / Corrigenda	Notes
	NA to BS EN 1993-1-3:2006	UK National Annex to Eurocode 3: Design of steel structures – Part 1-3 Supplementary rules for cold-formed members and sheeting	-	
	BS EN 1993-1-4:2006 + A2:2020	Eurocode 3: Design of steel structures – Part 1-4 General rules – Supplementary rules for stainless steels	+ A1:2015 Amendment No. 1 + A2:2020 Amendment No. 2	Supersedes BS EN 1993-1-4:2006 + A1:2015
	NA+A1:15 to BS EN 1993-1-4:2006+A1:2015	UK National Annex to Eurocode 3: Design of steel structures – Part 1-4 Supplementary rules for stainless steels	+ A1:2015 Amendment No. 1	
	BS EN 1993-1-5:2006+A2:2019	Eurocode 3: Design of steel structures – Part 1-5 Plated structural elements	Corrigendum April 2009, +A1:2017 Amendment No. 2, +A2:2019	
	NA+A1:2016 to BS EN 1993-1-5:2006	UK National Annex to Eurocode 3: Design of steel structures – Part 1-5 Plated structural elements	+ A1:2016 Amendment No. 1	
	BS EN 1993-1-6:2007+ A1:2017	Eurocode 3: Design of steel structures – Part 1-6 Strength and stability of shell structures	+ A1:2017 Amendment No. 1	
	BS EN 1993-1-7:2007	Eurocode 3: Design of steel structures – Part 1-7 Plated structures subject to out of plane loading	Corrigendum April 2009	
	BS EN 1993-1-8:2005	Eurocode 3: Design of steel structures – Part 1-8 Design of joints	Corrigenda December 2005, September 2006, July 2009 and August 2010	
	NA to BS EN 1993-1-8:2005	UK National Annex to Eurocode 3: Design of steel structures – Part 1-8 Design of joints	-	
	BS EN 1993-1-9:2005	Eurocode 3: Design of steel structures – Part 1-9 Fatigue	Corrigenda December 2005, September 2006 and April 2009	
	NA to BS EN 1993-1-9:2005	UK National Annex to Eurocode 3: Design of steel structures – Part 1-9 Fatigue	-	
	BS EN 1993-1-10:2005	Eurocode 3: Design of steel structures – Part 1-10 Material toughness and through-thickness properties	Corrigenda December 2005, September 2006 and March 2009	
	NA to BS EN 1993-1-10:2005	UK National Annex to Eurocode 3: Design of steel structures – Part 1-10 Material toughness and through thickness properties	-	
	BS EN 1993-1-11:2006	Eurocode 3: Design of steel structures – Part 1-11 Design of structures with tension components	Corrigendum April 2009	
	NA to BS EN 1993-1-11:2006	UK National Annex to Eurocode 3: Design of steel structures – Part 1-11 Design of structures with tension components	-	

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Eurocodes and associated UK National Annexes				
Used	Reference	Title	Amendment / Corrigenda	Notes
	BS EN 1993-1-12:2007	Eurocode 3: Design of steel structures – Part 1-12 Additional rules for the extension of EN 1993 up to steel grades S 700	Corrigendum April 2009	
	NA to BS EN 1993-1-12:2007	UK National Annex to Eurocode 3: Design of steel structures – Part 1-12 Additional rules for the extension of EN 1993 up to steel grades S 700	-	
	BS EN 1993-2:2006	Eurocode 3: Design of steel structures – Part 2 Steel bridges	Corrigendum July 2009	
	NA + A1:2012 to BS EN 1993-2:2006	UK National Annex to Eurocode 3: Design of steel structures – Part 2 Steel bridges	+ A1:2012	
	BS EN 1993-5:2007	Eurocode 3: Design of steel structures – Part 5 Piling	Corrigendum May 2009	
	NA + A1:2012 to BS EN 1993-5:2007	UK National Annex to Eurocode 3: Design of steel structures – Part 5 Piling	+ A1:2012	
	<i>Eurocode 4</i>	<i>Design of composite steel and concrete structures</i>		
	BS EN 1994-1-1:2004	Eurocode 4: Design of composite steel and concrete structures – Part 1-1 General rules and rules for buildings	Corrigendum April 2009	
	NA to BS EN 1994-1-1:2004	UK National Annex to Eurocode 4: Design of composite steel and concrete structures – Part 1-1 General rules and rules for buildings	-	
	BS EN 1994-2:2005	Eurocode 4: Design of composite steel and concrete structures – Part 2 General rules and rules for bridges	Corrigendum July 2008	
	NA to BS EN 1994-2:2005	UK National Annex to Eurocode 4: Design of composite steel and concrete structures – Part 2 General rules and rules for bridges	-	
	<i>Eurocode 5</i>	<i>Design of timber structures</i>		
	BS EN 1995-1-1:2004 + A2:2014	Eurocode 5: Design of timber structures – Part 1-1 General – common rules and rules for buildings	+ A2:2014 Incorporating corrigendum June 2006	
	NA to BS EN 1995-1-1:2004 + A1:2008	UK National Annex to Eurocode 5: Design of timber structures – Part 1-1 General – common rules and rules for buildings	+ A1:2014	
	BS EN 1995-2:2004	Eurocode 5: Design of timber structures – Part 2 Bridges	-	
	NA to BS EN 1995-2:2004	UK National Annex to Eurocode 5: Design of timber structures – Part 2 Bridges	-	
	<i>Eurocode 6</i>	<i>Design of masonry structures</i>		
	BS EN 1996-1-1:2005+A1:2012	Eurocode 6: Design of masonry structures – Part 1-1 General rules for reinforced and unreinforced masonry structures	+A1:2012 Corrigenda February 2006 and July 2009	
	NA to BS EN 1996-1-1:2005 +A1:2012	UK National Annex to Eurocode 6: Design of masonry structures – Part 1-1 General rules for reinforced and unreinforced masonry structures	+A1:2012	

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Eurocodes and associated UK National Annexes				
Used	Reference	Title	Amendment / Corrigenda	Notes
	BS EN 1996-2:2006	Eurocode 6: Design of masonry structures – Part 2 Design considerations, selection of materials and execution of masonry	Corrigendum September 2009	
	NA to BS EN 1996-2:2006	UK National Annex to Eurocode 6: Design of masonry structures – Part 2 Design considerations, selection of materials and execution of masonry	Corrigendum No.1	
	BS EN 1996-3:2006	Eurocode 6: Design of masonry structures – Part 3 Simplified calculation methods for unreinforced masonry structures	Corrigendum October 2009	
	NA +A1:2014 to BS EN 1996-3:2006	UK National Annex to Eurocode 6: Design of masonry structures – Part 3 Simplified calculation methods for unreinforced masonry structures	+A1:2014	
	<i>Eurocode 7</i>	<i>Geotechnical design</i>		
✓	BS EN 1997-1:2004+A1:2013	Eurocode 7: Geotechnical design – Part 1 General rules	+A1:2013 Corrigendum February 2009	
	NA+A1 to BS EN 1997-1:2004+A1:2013	UK National Annex to Eurocode 7: Geotechnical design – Part 1 General rules	+A1:2013 Incorporating Corrigendum No.1	
✓	BS EN 1997-2:2007	Eurocode 7: Geotechnical design – Part 2 Ground investigation and testing	Corrigendum June 2010	
	NA to BS EN 1997-2:2007	UK National Annex to Eurocode 7: Geotechnical design – Part 2 Ground investigation and testing	-	
	<i>Eurocode 8</i>	<i>Design of structures for earthquake resistance</i>		
	BS EN 1998-1:2004 + A1:2013	Eurocode 8: Design of structures for earthquake resistance – Part 1 General rules, seismic actions and rules for buildings	Corrigendum June 2009, January 2011 and March 2013	
	NA to BS EN 1998-1:2004	UK National Annex to Eurocode 8: Design of structures for earthquake resistance – Part 1 General rules, seismic actions and rules for buildings	-	
	BS EN 1998-2:2005+A2:2011	Eurocode 8: Design of structures for earthquake resistance – Part 2 Bridges	Corrigenda February 2010 and February 2012	
	NA to BS EN 1998-2:2005	UK National Annex to Eurocode 8: Design of structures for earthquake resistance – Part 2 Bridges	-	
	BS EN 1998-5:2004	Eurocode 8: Design of structures for earthquake resistance – Part 5 Foundations, retaining structures and geotechnical aspects	-	
	NA to BS EN 1998-5:2004	UK National Annex to Eurocode 8: Design of structures for earthquake resistance – Part 5 Foundations, retaining structures and geotechnical aspects	-	
	<i>Eurocode 9</i>	<i>Design of aluminium structures</i>		
	BS EN 1999-1-1:2007 + A2:2013	Eurocode 9: Design of aluminium structures– Part 1-1 General structural rules	+ A2:2013 Incorporating corrigendum March 2014	

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Eurocodes and associated UK National Annexes

Used	Reference	Title	Amendment / Corrigenda	Notes
	NA to BS EN 1999-1-1:2007 + A1:2009	UK National Annex to Eurocode 9: Design of aluminium structures – Part 1-1 General structural rules	National Amendment No.1 Corrigendum No.1	
	BS EN 1999-1-3:2007 + A1:2011	Eurocode 9: Design of aluminium structures – Part 1-3 Structures susceptible to fatigue	+ A1:2011	
	NA to BS EN 1999-1-3:2007 + A1:2011	UK National Annex to Eurocode 9: Design of aluminium structures – Part 1-3 Structures susceptible to fatigue	+ A1:2011	
	BS EN 1999-1-4:2007 +A1:2011	Eurocode 9: Design of aluminium structures – Part 1-4 Cold formed structural sheeting	+ A1:2011 Corrigendum November 2009	
	NA to BS EN 1999-1-4:2007	UK National Annex to Eurocode 9: Design of aluminium structures – Part 1-4 Cold formed structural sheeting	-	

BSI Published Documents

Used	Reference	Title	
<i>For guidance only unless clauses are otherwise specified in CD 350 Appendix A.</i>			
	PD 6687-1:2020	Background paper to the UK National Annexes to BS EN 1992-1 and BS EN 1992-3	Supersedes PD 6687-1:2010 See CD 350 clauses 3.6, 4.1, 4.2 and Appendix A for additional guidance. Clause 3.6 in CD 350 refers to clause 2.5 in PD 6687-1, this is now clause 4.5 in PD 6687-1 Clause 4.2 in CD 350 refers to clause 2.22 in PD 6687-1, this is now clause 4.21.4 in PD 6687-1
	PD 6687-2:2008	Recommendations for the design of structures to BS EN 1992-2:2005	See CD 350 clauses 4.1, 4.2 and Appendix A for additional guidance.
	PD 6688-1-1:2011	Recommendations for the design of structures to BS EN 1991-1-1	See CD 350 Appendix A for additional guidance.
	PD 6688-1-4:2015	Background paper to the UK National Annex to BS EN 1991-1-4	See CD 350 Appendix A for additional guidance.
	PD 6688-1-7:2009 +A1:2014	Recommendations for the design of structures to BS EN 1991-1-7	See CD350 clause 3.7 and Appendix B for additional guidance.
	PD 6688-2:2011	Recommendations for the design of structures to BS EN 1991-2	See CD 350 Appendix A for additional guidance.
	PD 6695-1-9:2008	Recommendations for the design of structures to BS EN 1993-1-9	See CD 350 Appendix A for additional guidance.
	PD 6695-1-10:2009	Recommendations for the design of structures to BS EN 1993-1-10	See CD 350 Appendix A for additional guidance.

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BSI Published Documents

Used	Reference	Title	
	PD 6695-2:2008 + A1:2012 Incorporating Corrigendum No.1	Recommendation for the design of bridges to BS EN 1993	See CD 350 Appendix A for additional guidance.
	PD 6696-2:2007 + A1:2012	Background paper to BS EN 1994-2 and the UK National Annex to BS EN 1994-2	See CD 350 Appendix A for additional guidance.
	PD 6698:2009	Recommendations for the design of structures for earthquake resistance to BS EN 1998	See CD 350 section 7 for additional guidance.
	PD 6702-1:2009+A1:2019	Structural use of aluminium. Recommendations for the design of aluminium structures to BS EN 1999	Amended 31 May 2019
	PD 6703:2009	Structural bearings – Guidance on the use of structural bearings	
	PD 6705-2:2020	Structural use of steel and aluminium. Execution of steel bridges conforming to BS EN 1090-2. Guide	Replaces PD 6705-2:2010 + A1:2013
	PD 6705-3:2009	Recommendations on the execution of aluminium structures to BS EN 1090-3	
	PD 6695-1-9:2008	Recommendations for the design of structures to BS EN 1993-1-9	See CD 350 Appendix A for additional guidance.

Execution Standards referenced in British Standards or Eurocodes

Used	Reference	Title	
	BS EN 1090-1:2009+A1:2011	Execution of steel structures and aluminium structures - Part 1: Requirements for conformity assessment of structural components	
	BS EN 1090-2:2018	Execution of steel structures and aluminium structures. Technical requirements for the execution of steel structures	Supersedes BS EN 1090-2:2008+A1:2011
	BS EN 1090-3:2019	Execution of steel structures and aluminium structures – Part 3: Technical requirements for aluminium structures	Supersedes BS EN 1090-3:2008
	BS EN 13670:2009 Incorporating corrigenda October 2015 and November 2015	Execution of concrete structures	

Product Standards referenced in British Standards or Eurocodes

Used	Reference	Title	
	BS EN 206:2013+A2:2021	Concrete – Specification, performance, production and conformity	Supersedes BS EN 206:2013+A1:2016
	BS EN 1317-1:2010	Road Restraint Systems – Part 1 – Terminology and general criteria for test methods	
✓	BS EN 1317-2:2010	Road Restraint Systems – Part 2 – Performance classes, impact test acceptance criteria and test methods for safety barriers.	
	BS EN 1317-3:2010	Road Restraint Systems – Part 3 – Performance classes, impact test acceptance criteria and test methods for crash cushions.	
	DD ENV 1317-4:2002	Road Restraint Systems – Part 4 – Performance classes, impact test acceptance criteria and test methods for terminals and transitions of safety barriers.	<i>Draft BS EN 1317-4 for public comment published in June 2012</i>

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Product Standards referenced in British Standards or Eurocodes

Used	Reference	Title	
	BS EN 1317-5:2007+A2:2012	Road Restraint Systems – Part 5 - Product requirements and evaluation of conformity for vehicle restraint systems	Incorporating corrigendum August 2012 <i>Draft prEN 1317-5 for public comment published in December 2013</i>
	PD CEN/TR 16949:2016	Road Restraint System – Pedestrian restraint system - Pedestrian parapets	<i>Bsi Published Document / CEN Technical Report published in July 2016</i> <i>(This document should not be used. The requirements of BS 7818:1995 apply.)</i>
	Draft prEN 1317-7	Road restraint systems - Part 7: Performance classes, impact test acceptance criteria and test methods for terminals of safety barriers	<i>Draft prEN 1317-7 for public comment published in June 2012</i> <i>(This document should not be used. All terminals should continue to be in accordance with ENV1317-4.)</i>
	PD CEN/TS 17342:2019	Road restraint systems - Motorcycle road restraint systems which reduce the impact severity of motorcyclist collisions with safety barriers	<i>Replaces PD CEN/TS 1317-8:2012</i> <i>(This document should not be used.)</i>
	PD CEN/TR 17081:2018	Design of fastenings for use in concrete – Plastic design of fastenings with headed and post-installed fasteners	
	BS EN 1337-1:2000	Structural bearings – Part 1: General Design Rules	
	BS EN 1337-2:2004	Structural bearings – Part 2: Sliding elements	
	BS EN 1337-3:2005	Structural bearings – Part 3: Elastomeric bearings	
	BS EN 1337-4:2004	Structural bearings – Part 4: Roller bearings	Corrigendum No.1 March 2007
	BS EN 1337-5:2005	Structural bearings – Part 5: Pot bearings	
	BS EN 1337-6:2004	Structural bearings – Part 6: Rocker bearings	
	BS EN 1337-7:2004	Structural bearings – Part 7: Spherical and cylindrical PTFE bearings	
	BS EN 1337-8:2007	Structural bearings – Part 8: Guide bearings and restraint bearings	
	BS EN 1337-9:1998	Structural bearings – Part 9: Protection	
	BS EN 1337-10:2003	Structural bearings – Part 10: Inspection and maintenance	Corrigendum No.1 November 2003
	BS EN 1337-11:1998	Structural bearings – Part 11: Transport, Storage and Installation.	
	BS EN 10025-1:2004	Hot rolled products of structural steels Part 1: General technical delivery conditions.	
	BS EN 10025-2:2019	Hot rolled products of structural steels Part 2: Technical delivery conditions for non-alloy structural steels.	Supersedes BS EN 10025-1:2004
	BS EN 10025-3:2019	Hot rolled products of structural steels Part 3: Technical delivery conditions for normalized/normalized rolled weldable fine grain structural steels.	Supersedes BS EN 10025-3:2004

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Product Standards referenced in British Standards or Eurocodes

Used	Reference	Title	
	BS EN 10025-4:2019	Hot rolled products of structural steels Part 4: Technical delivery conditions for thermomechanical rolled weldable fine grain structural steels.	Supersedes BS EN 10025-4:2004
	BS EN 10025-5:2019	Hot rolled products of structural steels – Part 5: Technical delivery conditions for structural steels with improved atmospheric corrosion resistance	Supersedes BS EN 10025-5:2004
	BS EN 10025-6:2019	Hot rolled products of structural steels – Part 6: Technical delivery conditions for flat products of high yield strength structural steels in the quenched and tempered condition.	Supersedes BS EN 10025-6:2004+A1:2009
	BS EN 10080:2005	Steel for the reinforcement of concrete – Weldable reinforcing steel - General	
	BS EN 10210-1:2006	Hot finished structural hollow sections of non-alloy and fine grain steels – Part 1: Technical delivery conditions	
	BS EN 10210-2:2019	Hot finished structural hollow sections – Part 2: Tolerances, dimensions and sectional properties	Supersedes BS EN 10210-2:2006
	BS EN 10248-1:1996	Hot rolled sheet piling of non alloy steels. Technical delivery conditions	
	BS EN 10248-2:1996	Hot rolled sheet piling of non alloy steels. Tolerances on shape and dimensions	
	BS EN 12063:1999	Execution of special geotechnical work. Sheet pile walls.	
	BS EN 14388:2005	Road traffic noise reducing devices	There is a 2015 version, however the 2015 version is not harmonised.
	BS EN 15050:2007 + A1:2012	Precast concrete products – Bridge elements	See CD 350 clause 3.8.1 for additional guidance.
	BS EN 15258:2008	Precast concrete products - Retaining wall elements	

British Standards

Used	Reference	Title	
	BS 4449:2005 +A3:2016	Steel for the reinforcement of concrete	No longer covers plain round bar. (See BS4482 up to 12mm dia, see BS EN 10025-1 for larger sizes and dowels. See BS EN 13877-3 for dowel bars in concrete pavements.)
	BS 5896:2012	Specification for high tensile steel wire and strand for the prestressing of concrete	
✓	BS 7818:1995	Specification for pedestrian restraint systems in metal	Incorporating Corrigendum No.1 May 2004 and Corrigendum No.2 September 2006 Currently the requirements of BS 7818:1995 are to be used instead of PD CEN/TR 16949:2016
✓	BS 8002:2015	Code of practice for earth retaining structures	

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British Standards

Used	Reference	Title	
	BS 8004:2015 +A1 2020	Code of practice for foundations	Amendment +A1:2020
	BS 8006-1:2010+A1:2016	Code of practice for strengthened/reinforced soils and other fills	
	BS 8500-1:2015+A2:2019	Concrete – Complementary British Standard to BS EN 206: Method of specifying and guidance for the specifier.	Incorporating Corrigendum No.1 and Corrigendum No.2 June 2020 Amendment +A2:2019
	BS 8500-2:2015+A2:2019	Concrete – Complementary British Standard to BS EN 206 : Specification for constituent materials and concrete.	Amendment +A2:2019
	BS 8666:2020	Scheduling, dimensioning, bending and cutting of steel reinforcement for concrete	Supersedes BS 8666:2005

The Manual Contract Document for Highway Works (MCHW)

Used	Reference	Title	
✓	MCHW Volume 1: July 2021	Specification for Highway Works	<i>Specification compliant with the execution standards must be used. A Departure is necessary for the parts where a compliant revision has not been published. Amendments July 2021</i>
✓	MCHW Volume 2: July 2021	Notes for guidance on the Specification for Highway Works	<i>Notes for guidance compliant with the execution standards must be used. A Departure is necessary for the parts where a compliant revision has not been published. Amendments July 2021</i>
✓	MCHW Volume 3: February 2017	Highway Construction Details	

The Design Manual for Roads and Bridges (DMRB)

Used	Reference	Title	
	GG 101 Revision 0.1.0	Introduction to the Design Manual for Roads and Bridges	Replaces GG 101 Revision 0
	GG 102 Revision 0	Quality Management Systems for Highway Design	Replaces GD 02/16
	GG 103 Revision 0	Introduction and general requirements for sustainable development and design	
	GG 104 Revision 0	Requirements for Safety Risk Assessment	Replaces GD04/12 and IAN 191/16

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The Design Manual for Roads and Bridges (DMRB)

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	GG 184 Revision 0	Specification for the use of Computer Aided Design	Replaces IAN 184/16
✓	CG 300 Revision 0.1.0	Technical approval of highway structures	Supersedes BD 2/12
	CG 302 Revision 0	As-built, operational and maintenance records for highway structures	Supersedes BD 62/07
	CG 303 Revision 0	Quality assurance scheme for paints and similar protective coatings	Supersedes BD 35/14
	CG 305 Revision 0	Identification marking of highway structures	Supersedes BD 45/93
	CG 501 Revision 2	Design of highway drainage systems	Supersedes HD 33/16, TA 80/99
	CD 127 Revision 1.0.1	Cross-sections and headrooms	Replaces TD 27/05 and TD 70/08
✓	CD 350 Revision 0	The design of highway structures	Supersedes BD 100/16, BA 57/01, BD 57/01 and IAN 124/11
	CD 351 Revision 0	The design and appearance of highway structures	Supersedes BA 41/98
	CD 352 Revision 0	Design of road tunnels	Supersedes BD 78/99
	CD 353 Revision 0	Design criteria for footbridges	Supersedes BD 29/17
	CD 354 Revision 1	Design of minor structures	Supersedes BD 94/17
	CD 355 Revision 0	Application of whole-life costs for design and maintenance of highway structures	Replaces BD 36/92 and BA 28/92
	CD 356 Revision 1	Design of highway structures for hydraulic action	Supersedes BA 59/94
	CD 357 Revision 1	Bridge expansion joints	Replaces BD 33/94, BA 26/94, IAN 168/12 and IAN 169/12
	CD 358 Revision 2	Waterproofing and surfacing of concrete bridge decks	Replaces BD 47/99, BA 47/99 and IAN 96/07
	CD 359 Revision 0	Design requirements for permanent soffit formwork	Supersedes BA 36/90 and IAN 131/11
	CD 360 Revision 2	Use of compressive membrane action in bridge decks	Supersedes BD 81/02
	CD 361 Revision 0	Weathering steel for highway structures	Supersedes BD 7/01
	CD 362 Revision 1	Enclosure of bridges	Replaces BD 67/96 and BA 67/96
	CD 363 Revision 0	Design rules for aerodynamic effects on bridges	Replaces BD 49/01
	CD 364 Revision 0	Formation of continuity joints in bridge decks	Replaces BA 82/00
	CD 365 Revision 1	Portal and cantilever signs/signals gantries	Replaces BD 51/14, IAN 193/16, BE 7/04
	CD 366 Revision 0	Design criteria for collision protection beams	Replaces BD 65/14
	CD 367 Revision 0	Treatment of existing structures on highways widening schemes	Replaces BD 95/07

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The Design Manual for Roads and Bridges (DMRB)

Used	Reference	Title	
	CD 368 Revision 0	Design of fibre reinforced polymer bridges and highway structures	Replaces BD 90/05
	CD 369 Revision 0	Surface protection for concrete highway structures	Replaces BA 85/04
	CD 371 Revision 0	Strengthening highway structures using fibre-reinforced polymers and externally bonded steel plates	Replaces BD 85/08, BD 84/02
	CD 372 Revision 0	Design of post-installed anchors and reinforcing bar connections in concrete	Supersedes IAN 104/15
	CD 373 Revision 0	Impregnation of reinforced and prestressed concrete highway structures using hydrophobic pore-lining impregnants	Supersedes BD 43/03
	CD 374 Revision 0	The use of recycled aggregates in structural concrete	Supersedes BA 92/07
	CD 375 Revision 1	Design of corrugated steel buried structures	Supersedes BD 12/01
	CD 376 Revision 0	Unreinforced masonry arch bridges	Replaces BD 91/04
✓	CD 377 Revision 4	Requirements for road restraint systems	Supersedes TD 19/06
✓	CD 622 Revision 1	Managing geotechnical risk	Replaces HD 22/08, BD 10/97 and HA 120/08
	CS 461 Revision 0	Assessment and upgrading of in-service parapets	Supersedes BA 37/92 and IAN 97/07
	GD 304 Revision 2	Designing health and safety into maintenance	Replaces IAN 69/15
	LA 104 Revision 1	Environmental assessment and monitoring	Supersedes HA 205/08, HD 48/08, IAN 125/15, and IAN 133/10
	LA 106 Revision 1	Cultural heritage assessment	Supersedes HA 208/07, HA 60/92, HA 75/01
	LA 110 Revision 0	Material assets and waste	Supersedes IAN 153/11
	LA 113 Revision 1	Road drainage and the water environment	Supersedes HD 45/09
	LD 119 Revision 0	Roadside environmental mitigation and enhancement	Formerly LA 119, which superseded HA 65/94 and HA 66/95

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Interim Advice Notes

Used	Reference	Title
✓	IAN 105/08	Implementation of construction (design and management) 2007 and the withdrawal of SD 10 and SD 11

Miscellaneous

Used	Reference	Title	
	CIRIA C543	Bridge Detailing Guide	
	CIRIA C686	Safe Access for Maintenance and Repair	
✓	CIRIA C760	Guidance on embedded retaining wall design	
	CIRIA C766	Control of cracking caused by restrained deformation in concrete	Supersedes C660

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APPENDIX B

DRAWINGS

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APPENDIX C

ADDITIONAL INFORMATION