

PO Box 1720
Huddersfield
HD1 9EL

APPROVAL IN PRINCIPLE FOR DESIGN OF

***Highway mass concrete burr wall alongside
Road 2A in new residential development off
Lingards Road, Slaithwaite***

Structure reference: -

Date: **25.01.24**

Revision: **0**

Status: **Draft**

Prepared by: **Paul Watson**

Checked by: **Martin Huddleston**

Scheme title: Residential development off Lingards Road,
Slaithwaite
Structure title: Road 2A Highway mass concrete burr wall

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DOCUMENT CONTROL

Structure title: Highway mass concrete burr wall in new residential development off Lingards Road, Slaithwaite

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Document issue record

Issue	Status	Prepared	Date	Checked	Date	Approved	Date
0	Draft	Paul Watson	25.01.24	Martin Huddleston	25.01.24		

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PROJECT DETAILS

Name of project: Residential Development off Lingards Road, Slaithwaite

Name of Bridge or Structure: Road 2A Highway mass concrete burr wall

Structure reference no: -

Summary:

This AIP covers the proposed design parameters for the proposed highway burr wall alongside Road 2A and is required as the burr wall will provide support to an adoptable highway. Anticipated construction date: March 2024

1. HIGHWAY DETAILS

1.1. Type of highway

1.1.1. Location and OS Map / Grid reference

Location:	Land off Lingards Road, Slaithwaite
OS Map:	SE 07300, 13350
Grid Ref (X, Y):	(407300, 413350)

1.2. Permitted traffic speed

30mph

1.3. Existing restrictions

N/A

2. SITE DETAILS

2.1. Obstacles crossed

Private garden to lower level of burr wall.

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3. PROPOSED STRUCTURE

3.1. Description of structure and design working life

Proposed masonry faced cast in-situ mass concrete burr wall supporting a new adoptable highway adjacent to Road 2A
Design working life 120 years in accordance with CD 350 The Design of Highway Structures.

3.2. Structural type

In-situ mass concrete burr wall.

3.3. Foundation type

Spread footings for burr wall sections.

3.4. Span arrangements

Maximum retained height to formation – 4.10m . Length 20.30m.

3.5. Articulation arrangements

10mm movement joint to be provided between wall sections. Wall base to act as spread footing.

3.6. Classes and levels

3.6.1. Consequence class

CC2

3.6.2. Reliability class

RC2

3.6.3. Inspection level

IL2

3.7. Road restraint systems requirements

Masonry parapet Normal containment Level N1 in compliance with DfT document “Guidance on the Design, Assessment and Strengthening of Masonry Parapets on Highways Structures See risk assessment in accordance with this document” in Appendix C. (1.20m high and 450mm thick) Reinforced with B500B Steel mesh reinforcement in accordance with BS 4483 and BS EN 10080

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3.8. Proposals for Water Management

Back of wall drainage to connect into land drainage system.

3.9. Proposed arrangements for future maintenance and inspection

3.9.1. Traffic management

Traffic management arranged by Kirklees council.

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

Access provided from footpath in front of plot 15 and from plot 15 garden and from Road 2A and plot 16 garden. Access rights to be written into the deeds of the property.

3.10. Environment and sustainability

The burr wall will be constructed from inert materials with minimal environmental impact. No maintenance painting will be required. The use of recycled aggregates will be considered subject to meeting required quality requirements.

3.11. Durability. Materials and finishes

Item	Material	Finish / Location
Gravity retaining wall	Mass concrete C32/40 with U2 and F2 finish to exposed surfaces in accordance with BS 8500-1 and BS EN 206-1.	U2 and F2 finish to exposed surfaces
Parapet	Natural stone. B500B steel mesh reinforcement in accordance with BS4483 and BS EN 10080	Natural stone parapet with horizontal stainless steel masonry reinforcing mesh to conform to BSEN10088-1

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Item	Material	Finish / Location
Facing stonework	Natural stone with minimum compressive strength of 15N/mm ² . Stonework fixing to be spaced at 450mm horizontally and 300mm vertically using stainless steel wall ties 5 No per Sq.m. Additionally, stone reinforcing mesh to be incorporated into the bedding joint below that containing the fixings. All fixings to be stainless steel. Stonework to be reasonably smooth and pointing to be near flush.	Stonework to front face of wall. All mortar to be M6 to BS EN1996-2.
Backfill material	Class 6N in compliance with specification for highway works, (SHW).	Backfill to structure.
Drainage	Provision of 150mm dia. PVC perforated longitudinal drain behind the wall taken to land drainage system together with 75mm dia. weep pipes at 2m centres.	Drainage to rear of wall.
Coping Stones	Pre-cast concrete	U3 and F3 finish

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

Haigh Huddleston & associates as principal designer have reviewed the risks and hazards identified in the AIP. Hazards considered in the design by the designer are working at height and working within an excavation. All excavations should have a safe batter with additional temporary support if required. Adequate scaffold platforms with edge protection should be utilised for working at height.

There are currently no live utility services adjacent to the wall to cause hazard during construction of the wall, however, services will be installed following completion of the wall and therefore any future contractors carrying out maintenance work on the wall should check for live services prior to work commencing.

3.13. Estimated cost of proposed structure together with other structural forms considered (including where appropriate proprietary manufactured

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structure), and the reasons for their rejection (including comparative whole life costs with dates of estimates)

Other structural forms considered include reinforced concrete retaining wall and sheet piled retaining wall.

This type of wall is considered the most appropriate for ease of construction, and long term maintenance requirements.

Cost of structure to be confirmed.

3.14. Proposed arrangements for construction

3.14.1. Construction of structure

Proposed burr wall falls within a new site and as such will not have any impact on existing highways or highway users.

3.14.2. Traffic management

N/A

3.14.3. Service diversions

N/A

3.14.4. Interface with existing structures

N/A

3.15. Resilience and security

Buried structure.

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4. DESIGN CRITERIA

4.1. Actions

4.1.1. Permanent actions

All permanent actions as outlined in BS EN 1991-1-1:2002 and associated National Annex.

4.1.2. Snow, Wind and Thermal actions

Snow loading not considered (NA to BS EN 1991-1-3 NA.4.1.1).

Thermal – Wall restricted to 7.20m long therefore no movement joints required.

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

20kN/m² surcharge in accordance with BS 8002:2015

4.1.4. Actions relating to General Order traffic under STGO regulations

30 kN/m² surcharge in accordance with BS 8002:2015.

4.1.5. Footway or footbridge variable actions

5kN/m² surcharge in accordance with BS 8002:2015

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

Vehicle restraint system in the form of reinforced masonry (450mm thick min) to provide N1 level of containment in compliance with the DfT “Guidance on the Design, Assessment and Strengthening of Masonry Parapets on Highways Structures

The burr wall will be designed to resist accidental impact from errant vehicles in accordance with BS EN 1317-1 and BS EN 1317-2.

A separate risk assessment in compliance with DfT document “Guidance on the Design, Assessment and Strengthening of Masonry Parapets on Highways Structures is provided in Appendix C .

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4.1.8. Action during construction

The burr wall is to be backfilled in accordance with the MCHW and surcharge loadings are to be derived based on the requirements of PD 6694-1:2011. Therefore, compaction pressures imposed on the wall during construction do not need to be considered. (PD 6694-1:2011 CL 7.3.3).

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 May 23 - See appendix A.

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

DfT document “Guidance on the Design, Assessment and Strengthening of Masonry Parapets on Highways Structures”.

4.6. Proposed departures from standards listed in 4.5

Provision of a reinforced masonry parapet 450 mm thick in designation (ii) mortar in accordance with DfT document “Guidance on the Design, Assessment and Strengthening of Masonry Parapets on Highways Structures.- Equivalent to normal (N1) Level of containment.

A risk assessment has been carried out for the justification of parapet choice and can be found in Appendix C.

Due to the narrow width of the proposed highway supported by the new burr wall, it is highly unlikely that an abnormal load could be routed along this road through the new residential area. Therefore, a departure from the approved

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standard, BS8002:2015 is proposed whereby the surcharge loading on the highway has been reduced to 20 kN/m².

It is anticipated that all other aspects will be covered by the standard in the TAS (May 2023) in Appendix A.

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

The proposed burr wall is to be adopted and a commuted sum will be payable in lieu of the adoption of the proposed burr wall as a highway maintainable structure under Section 38 of the Highways Act 1980.

4.8. Proposed safety critical fixings

N/A

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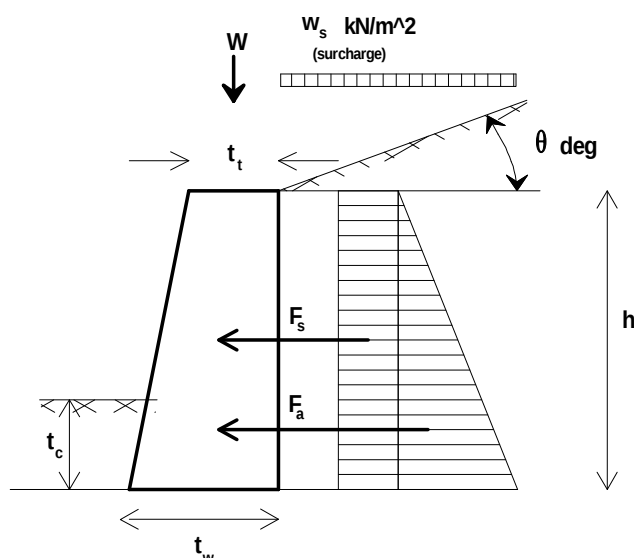
5. STRUCTURAL ANALYSIS

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

The method of analysis employed is to BS EN 1997-1:2004 incorporating Corrigendum dated February 2009 and UK National Annex incorporating Corrigendum No 1.

Burr wall base designed for appropriate bearing pressures for base of wall.

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



TC is a minimum of 200mm and the use of passive resistance of ground in front of the toe has been ignored in the design in accordance with "Procedure Guidelines for the Design and Construction of Structures Requiring Consent of the Highway Authority". A nominal surcharge of 20.0kN/m² has been used in the design in accordance with BS 8002:2015. The parapet has been designed for a vehicle impact in accordance with DfT document "Guidance on the Design, Assessment and Strengthening of Masonry Parapets on Highways Structures.

The parapet has not been designed for wind loading as the vehicle impact is considered to be more onerous.

For lesser impacts where the parapet will not fail, the load transfer into the wall below is considered negligible and is therefore not included in the design of the wall. For full methodology of parapet selection, see Appendix C.

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5.3. Assumptions intended for calculation of structural element stiffness

Parapet design in accordance with DfT document “Guidance on the Design, Assessment and Strengthening of Masonry Parapets on Highways Structures. Any bond between the parapet and the underlying substrate (i.e. the wall) is considered to be negligible.

- Allowable ground bearing pressure of 200kN/m²
- Surcharge is 20kN/m²
- Concrete density is 25kN/m³
- The backfill material is well graded free draining granular backfill. For the base material the effective angle of shear resistance used is $\Phi = 42^\circ$

Due to the provision of a perforated longitudinal drain behind the wall and the placement of granular backfill material behind the retaining structure no surcharge will be considered from water pressure.

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

Granular backfill to rear of walls to be Class 6N.
Based on $\Phi = 30^\circ$ for backfill material.

$K_a = 0.33$, $K_o = 0.542$

No Passive resistance will be permitted.

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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

The recommendations for the ground conditions given in the Haigh Huddleston & Associates Geo environmental site investigation report have been considered in the design of the wall and we accept the results in the report for the given ground conditions. The formation level will be inspected by an engineer from HHA to ensure adequate bearing strata.

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

Boreholes in this area of the site have revealed competent sandstone strata at approx. 800mm deep from proposed finished ground level, therefore the burr wall will be founded on sandstone strata.

The strata at foundation level will be proof rolled and inspected by the Engineer. If an allowable bearing pressure of 200 kN/m² cannot be confirmed, a further depth of material will be excavated to a width equal to the additional depth all-round the concrete base and replaced with well compacted granular material. The level and suitability of the foundation strata will be confirmed to the Technical Approval Authority by the Engineer.

Ground movements due to mining are not anticipated. See site investigation report in Appendix C.

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

10mm movement joint to be provided between wall sections. Wall base to act as spread footing.

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

Category 1 structure

DSL2

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

Proposed burr wall falls within a new site and as such will not have any impact on existing highways or highway users.

Excavation to be created with safe slope and means of access to full working area.

Mass concrete to be poured in max 950mm lifts with dovetail slots cast into concrete at allow fixing of natural stone.

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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
7567_002	Location plan
7567_100A	Mass concrete burr wall to road 2A

8.1.2. Documents (See appendix C)

Reference	Title
HHA	Ground Investigation extracts
HHA	Structural Calculations
HHA	Parapet Risk assessment

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9. THE ABOVE IS SUBMITTED FOR ACCEPTANCE

Design Team Leader

Signed _____

Name Paul Watson

Engineering Qualifications BSc (Hons) Civil Eng

Name of Organisation Haigh Huddleston & Associates

Date 25.01.24

Check Team Leader

Signed _____

Name Martin Huddleston

Engineering Qualifications MEng Civ Eng

Name of Organisation Haigh Huddleston & Associates

Date 25.01.24

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 _____

For and on behalf of Kirklees Council

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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 03 May 2023)

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 + A2:18 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	
✓	NA to BS EN 1991-1-6:2005	UK National Annex to Eurocode 1: Actions on structures. General Actions. Actions during execution	-	

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Eurocodes and associated UK National Annexes				
Used	Reference	Title	Amendment / Corrigenda	Notes
✓	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.
✓	Eurocode 2	Design of concrete structures		
✓	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		
	Eurocode 3	Design of steel structures		
	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	
	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

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Eurocodes and associated UK National Annexes

Used	Reference	Title	Amendment / Corrigenda	Notes
	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	-	
	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	

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Eurocodes and associated UK National Annexes

Used	Reference	Title	Amendment / Corrigenda	Notes
	Eurocode 4	Design of composite steel and concrete structures		
	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	-	
	Eurocode 5	Design of timber structures		
	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 + A2:2014	UK National Annex to Eurocode 5: Design of timber structures – Part 1-1 General – common rules and rules for buildings	+ A2:2014	
	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	-	
	Eurocode 6	Design of masonry structures		
✓	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	
✓	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	
	Eurocode 7	Geotechnical design		
✓	BS EN 1997-1:2004+A1:2013	Eurocode 7: Geotechnical design – Part 1 General rules	+A1:2013 Corrigendum February 2009	
✓	NA+A2:2022 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, Amendment 1 – July 2014 and Amendment 2 - 2022	Supersedes NA+A1:2014 to BS EN 1997-1:2004+A1:2013

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Eurocodes and associated UK National Annexes				
Used	Reference	Title	Amendment / Corrigenda	Notes
✓	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	-	
	Eurocode 8	Design of structures for earthquake resistance		
	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	-	
	Eurocode 9	Design of aluminium structures		
	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	
	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	-	

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BSI Published Documents

For guidance only unless clauses are otherwise specified in CD 350 Appendix A.

Used	Reference	Title	Notes
✓	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 6694-1:2011 + A1:2020	Recommendations for the design of structures subject to traffic loading to BS EN 1997-1	Incorporating Corrigendum January 2022 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.
	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	

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Execution Standards referenced in British Standards or Eurocodes

Used	Execution Standard reference	Title	Notes
	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	Notes
✓	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>
✓	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>

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Product Standards referenced in British Standards or Eurocodes			
Used	Reference	Title	Notes
	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
	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 10248-1:2023	Hot rolled sheet piling of non alloy steels. Technical delivery conditions	Supersedes BS EN 10248-1:1996
	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 13369:2018	Common rules for precast concrete products	

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Used	Reference	Title	Notes
	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	Notes
✓	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	
✓	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	MCHW reference	Title	Notes
✓	MCHW Volume 1: October 2022	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.</i> <i>Amendments October 2022</i> <i>Supersedes April 2022 version</i>
✓	MCHW Volume 2: October 2022	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</i>

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			<i>where a compliant revision has not been published. Amendments October 2022 Supersedes November 2021 version</i>
✓	MCHW Volume 3: February 2017	Highway Construction Details	

The Design Manual for Roads and Bridges (DMRB)			
Used	DMRB reference	Title	Notes
✓	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
	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 1.1.0	Design of minor structures	Supersedes CD 354 Revision 1
	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 2.4.0	Waterproofing and surfacing of concrete bridge decks	Supersedes CD 358 Revision 2.3.0
	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	Design criteria for collision protection beams	Replaces BD 65/14

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Used	DMRB reference	Title	Notes
	Revision 0		
	CD 367 Revision 0	Treatment of existing structures on highways widening schemes	Replaces BD 95/07
	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

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

Miscellaneous			
Used	Standard reference	Title	Notes
	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
	CIRIA C777	General fixings – guidance on selection and whole-life management	

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Additional Standards

Additional standards needed for a particular design should be listed here.

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APPENDIX B

DRAWINGS

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APPENDIX C

ADDITIONAL INFORMATION