

Flint Street,
Fartown,
Huddersfield
HD1 6LG

APPROVAL IN PRINCIPLE FOR DESIGN OF

Gravity Mass Masonry Retaining Wall

Structure reference:	<i>Structure Ref. (Provided by Kirklees Council)</i>
Date:	09/11/2020
Revision:	01
Status:	For Comment
Prepared by:	Richard Smith – Met Engineers Ltd
Checked by:	Ian Lang – Met Engineers Ltd

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DOCUMENT CONTROL

Structure title: Gravity Mass Masonry Retaining Wall,
Fold Farm, Netherton, HD4 7HB

Structure reference: *Structure Ref. (Provided by Kirklees Council)*

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Document issue record

Issue	Status	Prepared	Date	Checked	Date	Approved	Date
01	Comment	WST	09/11/20	RJS	09/11/20		

Scheme title: Fold Farm, Netherton Fold, Huddersfield, HD4 7HB**Structure title: Gravity Mass Masonry Retaining Wall**

PROJECT DETAILS

Name of project: Fold Farm, Netherton Fold, Huddersfield, HD4 7HB

Name of Bridge or Structure: Gravity Mass Masonry Retaining Wall

Structure reference no: TBC

Summary:

The initial portion of the road into the residential development site is relatively steep. The rapid change of level has required that the levels the individual properties are stepped relative to each other. The level difference calls for retention along the property boundaries. In some instances, the retention is situated in close proximity to the highway boundary and will support the highway. Mass Masonry & Reinforced Concrete retaining walls are proposed for instances where the highway will be supported by retention. Reinforced Concrete retaining walls will be used for taller walls and will be dealt with under a separate Approval in Principle application. The following refers to the various sections of Mass Masonry type retaining walls to be used where limited retention is required.

1. HIGHWAY DETAILS

1.1. Type of highway

1.1.1. Location and OS Map / Grid reference

Location:	Local Single Carriageway Estate Road, Street name is still to be agreed, Fold Farm, Netherton Fold, Huddersfield
OS Map:	SE123129
Grid Ref (X, Y):	412317,412924

1.2. Permitted traffic speed

To be confirmed - 30 mph max, although, 20mph may be appropriate

1.3. Existing restrictions

None

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2. SITE DETAILS

2.1. Obstacles crossed

Not applicable

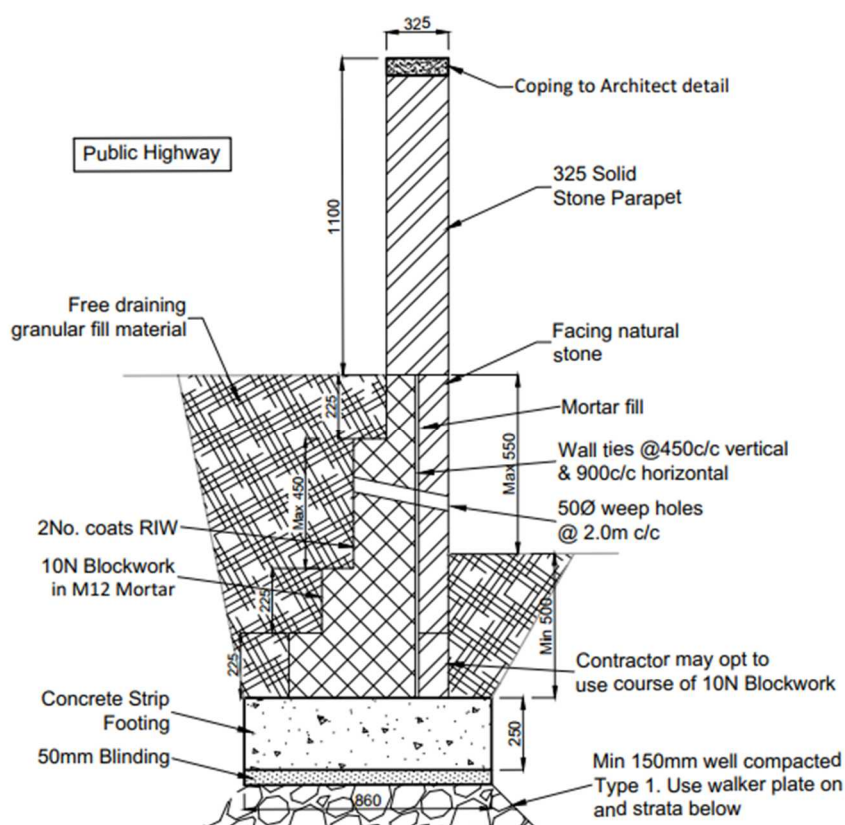
3. PROPOSED STRUCTURE

3.1. Description of structure and design working life

The works are to retain the various short sections of highway where boundary walls situated between individual dwellings returns across the front of the properties.

All walls will be situated wholly on private lands which are to be owned by the residents. As such the walls will not be offered for adoption by the Local Highway Authority.

Intended design life is 120 years.



3.2. Structural type

The wall, comprising reinforced concrete base & gravity mass masonry stem comprising natural stone and concrete blockwork together with a natural stone parapet wall.

3.3. Foundation type

The retaining wall has a spread foundation placed over engineered fill material comprising well compacted imported stone aggregate placed over a proof rolled formation.

3.4. Span arrangements

The level difference varies between zero and 1.1m clear height between top of foundation level and upper ground level.

3.5. Articulation arrangements

The expansion joints to be included within the masonry at 12.5 meters.

3.6. Classes and levels

As below

3.6.1. Consequence class

CC2

3.6.2. Reliability class

RC2

3.6.3. Inspection level

IL2

3.7. Road restraint systems requirements

There is a kerb line that will act as a buffer to protect the parapet wall from impact. The footpath is 2.0m wide to again restrict the parapet wall from vehicular impact from the adjacent highway.

The parapet wall itself will be constructed in accordance with DfT Document: Guidance on the Design, Assessment and Strengthening of Masonry Parapets on Highway Structures. The wall will be a 325mm thick natural stone wall utilising a bond arrangement which will comprise regular header courses and as such will comply with an N2 Road Restraint System.

3.8. Proposals for Water Management

Land drainage will be provided to the rear of each wall together with a suitable waterproofing system on the rear face. For external retaining walls, weep holes will be provided as indication of an issue with the land drainage system. Areas above the majority of these walls are hard paved with positive drainage incorporated.

3.9. Proposed arrangements for future maintenance and inspection

3.9.1. Traffic management

No traffic management will be required for inspection or maintenance of the wall cladding and parapet.

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

The structure is to remain in private ownership with the responsibility for the inspection and maintenance remaining with the individual property owners.

Access to the exposed lower side of the wall will be via private land. Access to the upper side of the wall will be via public highway.

3.10. Environment and sustainability

Conventional construction materials are proposed and therefore no significant sustainability issues are foreseen. Consideration will be given to minimising future maintenance requirements through careful choice materials for waterproofing alongside appropriate detailing.

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3.11. Durability. Materials and finishes

Item	Material	Finish / Location
Reinforced Concrete base	Reinforced concrete C35/45 in accordance with BS 8500-1 and BS EN 206-1. B500B Steel reinforcement in accordance with BS 4449 and BS EN 10080.	Exposure class for all elements; chloride XD3, carbonation XC3, freeze thaw XF2, for 120 years design working life.
Backfill Material	Natural Gravel or similar backfill conforming to Class 6N of Series 600: Earthworks Specification for Highway Works	Backfill to structure
Waterproofing	2 Coats MULSEAL Protective Waterproof system or similar BBA approved system in conjunction with Terram 1B1 Drainage Composite Protective sheet drain.	Rear face of wall stem & base
Land drainage	Provision of 150mm dia. PVC perforated longitudinal drain behind the wall taken to a suitable outfall together with 100mm dia. weep pipes at 2m centres.	Land drainage to rear of wall stem
Masonry	Natural Stone Masonry to match the properties on the development. Concrete Blockwork	Wall stem
Masonry Parapet	Natural Stone Masonry to match the properties on the development	Parapet The stone unit type and mortar colour are to be selected to suit aesthetic requirements. Bond type will be a Double Flemish or similar and must contain regular header courses.

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

Design Aspects - Geotechnical Design Parameters – monitoring and reporting of soil types is required as the work progresses. Differences to design assumptions are to be reported to the Designer immediately and a design review carried out.

Execution Aspects - The R.C. base and mass masonry wall will be built in two sections, base first and stem second. The length of wall to be built at each stage will be determined prior to commencement on site. The groundworks team will consist of a Foreman, steelfixers and masonry contractors all of which have the necessary Construction Skills Certification Scheme (CSCS) / Construction Plant Competence Scheme (CPCS) qualifications and are suitably experienced and competent. Excavation is not deep, and the ground behind the wall will be suitably battered back to allow working space. Brickwork will follow as soon as the concrete to the base has cured sufficiently.

Risk Assessment and Method Statement will be developed and agreed prior to works commencing in accordance with Professional Standards.

Risks include

- Working close to the highway
- Protection of the highway
- Protection of services within the highway. All services are to be located and marked. As above, protection to be laid across the highway to protect the services within the carriageway from loading and damage
- Edge protection/scaffold system required during construction of the wall
- Edge protection/scaffold system required during construction of the wall

Demolition - Safe removal of the proposed structure is achievable using standard demolition techniques. No prestressed or post tensioned elements are proposed.

Hazards

- Steeply sloping site
- No other site specific or abnormal hazards not usually associated with the construction of retaining walls.

All works are to be undertaken in accordance with the Construction (Design & Management) Regulations 2015.

3.13. 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)

Not Applicable. Structures are not to be offered for adoption

3.14. Proposed arrangements for construction

3.14.1. Construction of structure

Excavation of base first and battering back of the land to the rear of the retaining wall, this will be followed by formwork reinforcement and concreting to the base, kicker formed and then formwork reinforcement and concreting of the wall stem. As soon as the concrete has sufficiently cured then brickwork face and top will be completed.

3.14.2. Traffic management

The structure is to be constructed within private land. The footway on the proposed highway will not be in existence at the time of the construction. Therefore, no traffic management issues are anticipated.

3.14.3. Service diversions

No service diversions are anticipated.

3.14.4. Interface with existing structures

The structure does not interface with any existing structures.

3.15. Resilience and security

The structure will be below ground and located adjacent to the highway of a residential cul-de-sac. No special precautions are considered necessary to increase the resilience of the structure against deliberate acts of Vandalism, Theft or Terrorism.

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4. DESIGN CRITERIA

4.1. Actions

4.1.1. Permanent actions

Earth pressures in accordance with BS EN 1997-1:2004

Material Self Weight in accordance with BS EN 1991-1-1:2002

4.1.2. Snow, Wind and Thermal actions

Snow Loading – Not applicable

Wind Loading –in accordance with BS EN 1991-1-4

Thermal Actions – in accordance with BS EN 1991-1-5

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

Load Model 1

4.1.4. Actions relating to General Order traffic under STGO regulations

Not applicable

4.1.5. Footway or footbridge variable actions

12kN/m²

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

Not applicable

4.1.7. Accidental actions

Not applicable

4.1.8. Action during construction

Not exceeding anticipated in-service loads

4.1.9. Any special action not covered above

Not applicable

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

Not applicable

To be stated.

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4.3. Proposed minimum headroom provided

Not applicable

4.4. Authorities consulted and any special conditions required

Representatives of Kirklees Council, Highway Department
Special conditions – None currently advised

4.5. Standards and documents listed in the Technical Approval Schedule

TAS dated April 2020 - 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 Highway Structures.

4.6. Proposed departures from standards listed in 4.5

None

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

No departures – design to EC7

4.8. Proposed safety critical fixings

None

5. STRUCTURAL ANALYSIS

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

Calculation in accordance with BS EN 1997-1:2004, (Cl 2.4)

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

Gravity Mass Masonry Retaining Wall

Refer to typical construction detail

5.3. **Assumptions intended for calculation of structural element stiffness**

Not applicable

To be stated.

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

$K_a = 0.29$, $K_p = 4.29$

$k_0 = (As\ 9.5.2(3)\ BS\ EN\ 1997-1:2004)$

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**

Development levels require that the walls will be constructed in built up ground. Ground conditions will be monitored throughout and any deviations reported back to the designer.

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

Included within Appendix

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

No significant differential settlement anticipated

- 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**

Not applicable

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7. CHECK

7.1. Proposed Category and Design Supervision Level

Category 0

7.2. If Category 3, name of proposed Independent Checker

Not applicable

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

Not applicable

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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
19-00650-Met-M2-C-008	Site Levels Plan
19-00650-Met-M2-S-048	RTW between plot 11-12 GA
19-00650-Met-M2-S-049	RTW between plots 10-11 GA
19-00650-Met-M2-S-050	RTW between plot 10-11 GA
19-00650-Met-M2-S-051	RTW between plot 9-10 GA
19-00650-Met-M2-S-052	RTW between plot 6-9 GA
19-00650-Met-M2-S-053	RTW between plots 5-6 GA
19-00650-Met-M2-S-054	RTW between plots 4-5 GA
19-00650-Met-M2-S-053	RTW between plots 5-6 GA
19-00650-Met-M2-S-057	RTW between plot 7-8 GA

8.1.2. Documents (See appendix C)

Reference	Title
GI Report	Phase 2 Site Investigation Report P19-00650-Met-RP-GE-002 Available to download from Kirklees Planning Portal under planning application reference 2019/92361

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9. THE ABOVE IS SUBMITTED FOR ACCEPTANCE

We confirm that details of the temporary works design will be/have [Delete as appropriate] been passed to the permanent works Designer for review. [This statement is applicable to temporary works design AIP only]

Design Team Leader**Signed****Name**

Richard Smith

Engineering Qualifications

CEng MIStructE

Name of Organisation

Met Engineers Ltd

Date

09/11/2020

Check Team Leader**Signed****Name**

Ian Lang

Engineering Qualifications

CEng MICE

Name of Organisation

Met Engineers Ltd

Date

09/11/2020

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

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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 April 2020)

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	
	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	
	NA to BS EN 1990:2002 + A1:2005	UK National Annex to Eurocode 0 Basis of structural design	National Amendment No.1	
	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	-	
	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	+A1:2015 Incorporating corrigendum No.1	
	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	
	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	.
	BS EN 1991-2:2003	Eurocode 1: Actions on structures. Traffic loads on bridges	Corrigenda December 2004 and February 2010	
	NA to BS EN 1991-2:2003	UK National Annex to Eurocode 1: Actions on structures. Traffic loads on bridges	Corrigendum No.1	
	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 structure – Part 3: Liquid retaining and containment structures	-	
	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	Eurocode 3: Design of steel structures – Part 1-4 General rules – Supplementary rules for stainless steels	-	
	NA to BS EN 1993-1-4:2006	UK National Annex to Eurocode 3: Design of steel structures – Part 1-4 Supplementary rules for stainless steels	-	

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Eurocodes and associated UK National Annexes

Used	Reference	Title	Amendment / Corrigenda	
	BS EN 1993-1-5:2006+A1:2017	Eurocode 3: Design of steel structures – Part 1-5 Plated structural elements	Corrigendum April 2009, +A1:2017 Amendment No. 1	
	NA to BS EN 1993-1-5:2006	UK National Annex to Eurocode 3: Design of steel structures – Part 1-5 Plated structural elements	-	
	BS EN 1993-1-6:2007	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	
	Eurocode 4	Design of composite steel and concrete structures		

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Used	Reference	Title	Amendment / Corrigenda	
	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 + A1:2008	UK National Annex to Eurocode 5: Design of timber structures – Part 1-1 General – common rules and rules for buildings	+ A1:2008 Incorporating National Amendment No. 2	
	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	Eurocode 6: Design of masonry structures – Part 1-1 General rules for reinforced and unreinforced masonry structures	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	Corrigendum October 2015	
	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+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	

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Used	Reference	Title	Amendment / Corrigenda	
	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	-	

BSI Published Documents

Used	Reference	Title	
For guidance only unless clauses are otherwise specified in BD 100/16 Annex B.			
	PD 6688-1-1:2011	Recommendations for the design of structures to BS EN 1991-1-1	
	PD 6688-1-4:2015	Background paper to the UK National Annex to BS EN 1991-1-4	

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BSI Published Documents

Used	Reference	Title	
	PD 6688-1-7:2009 +A1:2014	Recommendations for the design of structures to BS EN 1991-1-7	.
	PD 6688-2:2011	Recommendations for the design of structures to BS EN 1991-2	
	PD 6687-1:2010	Background paper to the UK National Annexes to BS EN 1992-1 and BS EN 1992-3	
	PD 6687-2:2008	Recommendations for the design of structures to BS EN 1992-2:2005	
	PD 6695-1-9:2008	Recommendations for the design of structures to BS EN 1993-1-9	
	PD 6695-1-10:2009	Recommendations for the design of structures to BS EN 1993-1-10	
	PD 6695-2:2008 + A1:2012 Incorporating Corrigendum No.1	Recommendation for the design of bridges to BS EN 1993	
	PD 6696-2:2007 + A1:2012	Background paper to BS EN 1994-2 and the UK National Annex to BS EN 1994-2	
	PD 6694-1:2011	Recommendations for the design of structures subject to traffic loading to BS EN 1997-1	
	PD 6698:2009	Recommendations for the design of structures for earthquake resistance to BS EN 1998	
	PD 6703:2009	Structural bearings – Guidance on the use of structural bearings	
	PD 6705-2:2010 + A1:2013	Recommendations for the execution of steel bridges to BS EN 1090-2	Amended 30 April 2013
	PD 6705-3:2009	Recommendations on the execution of aluminium structures to BS EN 1090-3	
	PD 6702-1:2009	Structural use of aluminium. Recommendations for the design of aluminium structures to BS EN 1999	

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	
	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 (+A1:2016)	Concrete – Specification, performance, production and conformity	Corrigendum May 2014
	BS EN 1317-1:2010	Road Restraint Systems – Part 1 – Terminology and general criteria for test methods	

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Product Standards referenced in British Standards or Eurocodes

Used	Reference	Title	
	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	<i>Incorporating corrigendum August 2012 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 (This document should temporarily not be used. The requirements of BS 7818:2015 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>
	PD CEN/TR 1317-8:2012	Road restraint systems - Part 8: Motorcycle road restraint systems which reduce the impact severity of motorcyclist collisions with safety barriers	<i>Bsi Published Document / CEN Technical Specification published in May 2012</i>
	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	
	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	
	BS EN 1337-11:1998	Structural bearings – Part 11: Transport, Storage and Installation.	
	BS EN 1794-1:2018	Road traffic noise reducing devices – Non-acoustic performance Part 1: Mechanical performance and requirements	<i>Supersedes previous version BS EN 1794-1:2011</i>
	BS EN 1794-2:2011	Road traffic noise reducing devices – Non-acoustic performance Part 2: General safety and environmental requirements	
	BS EN 10025-1:2004	Hot rolled products of structural steels Part 1: General technical delivery conditions.	
	BS EN 10025-2:2004	Hot rolled products of structural steels Part 2: Technical delivery conditions for non-alloy structural steels.	

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Product Standards referenced in British Standards or Eurocodes

Used	Reference	Title	
	BS EN 10025-3:2004	Hot rolled products of structural steels Part 3: Technical delivery conditions for normalized/normalized rolled weldable fine grain structural steels.	
	BS EN 10025-4:2004	Hot rolled products of structural steels Part 4: Technical delivery conditions for thermomechanical rolled weldable fine grain structural steels.	
	BS EN 10025-5:2004	Hot rolled products of structural steels – Part 5: Technical delivery conditions for structural steels with improved atmospheric corrosion resistance	
	BS EN 10025-6:2004+A1:2009	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.	
	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 10210-2:2006	Hot finished structural hollow sections of non-alloy and fine grain steels – Part 2: Tolerances, dimensions and sectional properties	<i>Incorporating corrigendum no. 1</i>
	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 15050:2007 + A1:2012	Precast concrete products – Bridge 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	Currently the requirements of BS 7818:2015 are to be used instead of PD CEN/TR 16949:2016
	BS 8002:2015	Code of practice for earth retaining structures	
	BS 8004:2015	Code of practice for foundations	
	BS 8006-1:2010 + A1:2016	Code of practice for strengthened/reinforced soils and other fills	
	BS 8500-1:2015 + A1:2016	Concrete – Complementary British Standard to BS EN 206 : Method of specifying and guidance for the specifier.	Incorporating Corrigendum No.1
	BS 8500-2:2015 + A1:2016	Concrete – Complementary British Standard to BS EN 206 : Specification for constituent materials and concrete.	

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British Standards

Used	Reference	Title	
	BS 8666:2005	Scheduling, dimensioning, bending and cutting of steel reinforcement for concrete	Incorporating Amendment No.1

The Manual Contract Document for Highway Works (MCHW)

Used	Reference	Title	
	MCHW Volume 1: March 2020	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>
	MCHW Volume 2: March 2020	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.</i>
	MCHW Volume 3: March 2020	Highway Construction Details	

The Design Manual for Roads and Bridges (DMRB)

Used	Reference	Title	
	CG 300	Technical Approval of Highway Structures	Replaced BD2/12
	CG 302	As built, operational and maintenance records for highway structures.	<i>(Formerly known as BD 62/07)</i>
	CG 303	Quality assurance scheme for paints and similar protective coatings	<i>(Formerly known as BD 35/14)</i>
	CG 305	Identification marking of highway structures	<i>(Formerly known as BD 45/93)</i>
	CD 109	Highway link design	<i>(Formerly known as TD9/93 & TD70/08)</i>
	CD 122	Geometric design of grade separated junctions	<i>(Formerly known as TD22/06, TD39/94, TD40/94)</i>
	CD 127	Cross-sections and headrooms	<i>(Formerly known as TD27/05 & TD70/08)</i>
	CD 146	Positioning of signalling and advance direction signs	<i>Formerly known as TD46/05, TD18/85)</i>
	CD 350	The design of Highway structures	<i>Replace BD100/16, BA57/01, BD57/01, IAN 124/11</i>
	CD 351	The design and appearance of Highway structures	<i>(Formerly known as BA41/98)</i>
	CD 352	The design of road tunnels	<i>(Formerly known as BD78/99)</i>
	CD 353	Design criteria for footbridges	<i>(Formerly known as BD29/17)</i>

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Used	Reference	Title	
	CD 354	Design of minor structures	(Formerly known as BD 94/ 17 and replace BD94/17)
	CD 355	Application of whole-life cost of design and maintenance of highway structures	(Formerly known as BD 36/92 & BA 28/92)
	CD 356	Design of Highway structure for hydraulic action	(Formerly known as BA 59/94)
	CD 357	Bridge expansion joints	(Formerly known as BD33/94, BA26/94, IAN168/12, IAN169/12)
	CD 358	Waterproofing and surfacing of concrete bridge decks	(Formerly known as BA 59/94, IAN 96/07r1 and BD47/99)
	CD 359	Design requirement of permanent soffit formwork	(Formerly known as BA 36/90, IAN131/11)
	CD 360	Use of compressive membrane action on bridge decks	(Formerly known as BD81/02)
	CD 361	Weathering steel for highway structures	(Formerly known as BD07/01)
	CD 362	Enclosure of bridges	(Formerly known as BD67/96, BA67/96)
	CD 363	Design rules for the aerodynamic effects on the bridges	(Formerly known as BD 49/01)
	CD 364	Formation of continuity joints in bridge decks	(Formerly known as BD 82/00)
	CD 365	Portal and cantilever signs/signals gantries	(Formerly known as BD 51/14, IAN193/16, BE7/04)
	CD366	Design criteria for collision protection beams	(Formerly known as BD65/14)
	CD367	Treatment of existing structures on highway widening schemes	(Formerly known as BD 95/07)
	CD 368	Design of fibre reinforced polymer bridges and highway structures	(Formerly known as BD 90/05))
	CD 369	Surface protection for concrete highway structures	(Formerly known as BA85/04)
	CD 370	Cathodic protection for use in reinforced concrete highway structures	(Formerly known as BA83/02)
	CD 371	Strengthening highway structures using fibre-reinforced polymers and externally bonded steel plates	(Formerly known as BD85/08, BD84/02)
	CD 372	Design of post-installed anchors and reinforcing bar connections in concrete	(Formerly known as IAN 104/15)
	CD 373	Impregnation of reinforced and prestressed concrete highway structures using hydrophobic pore-lining impregnates	(Formerly known as BD43/03)
	CD 374	The use of recycled aggregates in structural concrete	(Formerly known as BA92/07)
	CD 375	Design of corrugated steel buried structures	(Formerly known as BD12/01)
	CD 376	Unreinforced masonry arch bridges	(Formerly known as BD91/04)
	CD 377	Requirements for road restraint systems	(Formerly known as TD19/06)
	CD 378	Impact test and assessment criteria for truck attenuators	(Formerly known as TD 49/07)
	CD 377	Requirements for road restraint systems	(Formerly known as TD19/06)
	CD 378	Impact test and assessment criteria for truck attenuators	(Formerly known as TD 49/07)
	CD 622	Managing geotechnical risk	(Formerly known as HD22/08, BD10/97, HA120/08))

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Used	Reference	Title	
	CM 430	Maintenance of road tunnels	(Formerly known as BA72/03)
	CM 431	Maintenance painting of steelwork	(Formerly known as BD 87/05)
	CM 432	Maintenance of buried concrete box structures	(Formerly known as BA88/04)
	CM 125	Maintenance of traffic signs	(Formerly known as TD 25/15)
	CS 125	Inspection of traffic signs	(Formerly known as TD 25/15)
	CS 432	Inspection of buried concrete box structures	(Formerly known as BA88/04)
	CS 450	Inspection of highway structures	(Formerly known as BD63/17)
	CS 451	Structural review and assessment of highway structures	(Formerly known as BD 101/11)
	CS 452	Inspection and records for road tunnel systems	(Formerly known as BD53/95)
	CS 453	Assessment of highway bridge supports	(Formerly known as BD48/93, BD60/04, IAN 91/07)
	CS 454	Assessment of highway bridges and structures	(Formerly known as BD21/01, BA16/97, BD37/01)
	CS 455	The Assessment of concrete highway bridges and structures	(Formerly known as BD44/15, BA38/93, BA40/93, BA51/95, BA52/94)
	CS 456	The assessment of steel highway bridges and structures	(Formerly known as BD56/10)
	CS 457	The assessment of composite highway bridges and structures	(Formerly known as BD61/10)
	CS 458	The assessment of highway bridges and structures for the effects of special type general order (STGO) and special order (SO) vehicles	(Formerly known as BD 86/11)
	CS 459	The assessment of bridge substructures, retaining structures and buried structures	(Formerly known as BA55/06)
	CS 460	Management of corrugated steel buried structures	(Formerly known as BA87/04)
	CS 461	Assessment and upgrading of in-service parapets	(Formerly known as BA37/92, IAN97/07)
	CS 462	Repair and management of deteriorated concrete highway structures	(Formerly known as BA35/90, BA52/94)
	CS 463	Load testing for bridge assessment	(Formerly known as BA54/94)
	CS 464	Non-destructive testing of highway structures	(Formerly known as BA86/06)
	CS 465	Management of post-tensioned concrete bridges	(Formerly known as BD54/15)
	CS 466	Risk management and structural assessment of concrete half-joint deck structures	(Formerly known as BA87/04)
	CS 467	Risk management and structural assessment of concrete deck hinge structures	(Formerly known as BA93/09)
	CS 468	Assessment of Freyssinet concrete hinges in highway structures	(Formerly known as BE5/75)
	CS 470	Management of sub-standard highway structures	(Formerly known as BD 79/13)
	CZ 125	Disposal of traffic signs	(Formerly known as TD25/15)
	GD 02/16	Quality Management Systems for Highway Design	

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Used	Reference	Title	
	GD 304	Designing health and safety into maintenance	<i>(Replace IAN 69/15)</i>
	LD 119	Roadside environmental mitigation and enhancement	<i>(Formerly known as HA65/94, HA66/95)</i>
	GG 104	Requirements for safety risk assessment	<i>(Formerly known as GD04/12 and IAM 191/16)</i>
	GG 105	Asbestos management	<i>(Formerly known as GD05/16)</i>
	GG 119	Road Safety audit	<i>(Formerly known as HD19/15)</i>

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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
	IAN 136/10	Structural safety reporting
	IAN 161/15	Smart Motorways

Miscellaneous

Used	Reference	Title	
	CHE Memorandum 227/08	The Impregnation of Reinforced and Prestressed Concrete Highway Structures using Hydrophobic Pore Lining Impregnants	CHE memoranda are internal Highways England documents and not available to external organisations. This CHE memorandum is included as a useful reference for the Technical Approval Authority.
	CIRIA C543	Bridge Detailing Guide	
	CIRIA C656	Masonry arch bridges: condition, appraisal and remedial treatment	
	CIRIA C660	Early-age Thermal Crack Control in Concrete	
	CIRIA C676	Drystone retaining walls and their modifications: condition appraisal and remedial treatment	
	CIRIA C686	Safe Access for Maintenance and Repair	
	CIRIA C760	Guidance on embedded retaining wall design	
	CIRIA R155	Bridges- design for improved durability	1996
	DfT UK Roads liaison group	Provision of Road Restraint systems on Local Highway Authority Roads	October 2011

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APPENDIX B

DRAWINGS

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APPENDIX C

ADDITIONAL INFORMATION