

Flint Street,
Fartown,
Huddersfield
HD1 6LG

APPROVAL IN PRINCIPLE FOR DESIGN
OF

***Private Burr Wall at New Aldi Store,
supporting A640 New Hey Road,
Huddersfield, HD3 4DD***

Structure reference: K60893
Date: 18/03/2022
Revision: D
Status: Final
Prepared by: Anthony Armitage
Checked by: Peter Liddiard

Information is available in large print, braille, audio tape, or PC disk on request
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Scheme title: New Aldi Store, A640 New Hey Road, Huddersfield
Structure title: Private Burr Wall Supporting Highway

Struc Ref: K60893
Rev D Mar 22

DOCUMENT CONTROL

Structure title: Private Burr Wall Supporting A640 New Hey Road, Huddersfield

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Document issue record

Issue	Status	Prepared	Date	Checked	Date	Approved	Date
Rev A	Draft	A.Armitage	July21	P.Liddiard	July21	A.Cooper	July21
B	Draft	Adrian Batey	Oct 21	Dean Gray	Oct 21	A Cooper	Oct 21
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PROJECT DETAILS

Name of project: New Aldi Store, A640 New Hey Road

Name of Bridge or Structure: Retaining Wall to Carpark

Structure reference no: K60893

Summary:

Proposed new private burr wall to support existing highway adjacent to the proposed new Aldi Stores Car Park on A640 New Hey Road, Huddersfield

1. HIGHWAY DETAILS

1.1. Type of highway

1.1.1. Location and OS Map / Grid reference

Location: A640 New Hey Road, Huddersfield, HD3 4DD

OS Map: SE118174

Grid Ref (X, Y): (411898, 417431)

1.2. Permitted traffic speed

40mph

1.3. Existing restrictions

None known

2. SITE DETAILS

2.1. Obstacles crossed

Not applicable

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3. PROPOSED STRUCTURE

3.1. Description of structure and design working life

Reinforced Concrete burr wall faced with stone to car park elevation required to support the adjoining highway due to the proposed lowering of the ground levels in the new Aldi Store car park.

The proposed wall to have a design working life Category 5 (120 years) in accordance with BS EN 1990:2002.

3.2. Structural type

Reinforced concrete cantilevered burr wall

3.3. Foundation type

Ground bearing

3.4. Span arrangements

The length of the proposed wall is approximately 40.6m with a maximum retained height of approximately 2.70m between formation level within the site and finished levels adjacent to the existing site boundary wall.

3.5. Articulation arrangements

Movement joints to be provided in the stone facing to the wall at approximately 6m maximum centres as detailed on the architects' details. Location of construction joints in the reinforced concrete base and stem will be agreed with the contractor to suit construction sequence.

3.6. Classes and levels

Burr wall to be Consequence Class (CC2), Reliability Class (RC2) and inspection level 2.

3.6.1. Consequence class

Consequence Class 2 (See BS EN 1990-2002+A1-2005 B3.1)
Consequence class to be CC2 (Medium consequence for loss of human life, economic social or environmental consequences considerable)

3.6.2. Reliability class

Reliability Class 2 (see BS EN 1990-2002+A1-2005 B3.2/B3.3) Reliability class is to be associated with the consequence class detailed in 3.6.1
Reliability class to be RC2. Factor for actions to be used KFI =1,0

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3.6.3. Inspection level

Inspection Level 2 – Normal inspection (inspection in accordance with the procedures of the inspecting organisation)

3.7. Road restraint systems requirements

Existing masonry boundary wall to be reduced in height to provide a 1.2m high parapet and to facilitate the construction of the proposed burr wall. It is proposed that the reduced height existing wall will provide restraint in accordance with Department of Transport "Guidance on the Design, Assessment and Strengthening of Masonry Parapets on Highway Structures.

The parapet wall will be 1.20m high and 450mm thick natural stone wall and as such will comply with an N1 Road Restraint System.

3.8. Proposals for Water Management

A longitudinal drain will be installed to rear of proposed wall immediately above the heel of the retaining wall base. All land drainage will be taken to and discharge to a suitable outfall. Weep holes will also be provided through the wall at 2.0m maximum centres.

3.9. Proposed arrangements for future maintenance and inspection

3.9.1. Traffic management

It is anticipated that the public footpath may remain open for inspections, but a footway closure may be required from the H.A. for anything but minor maintenance to the proposed wall.

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

Proposed burr wall will be located wholly within land belonging to Aldi Stores Ltd. Aldi Stores Ltd to maintain the burr wall

3.10. Environment and sustainability

Any stone cladding to be reclaimed from existing structures within the site. No other environmental protections required.

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3.11. Durability. Materials and finishes

Item	Material	Finish / Location
Reinforced Concrete stem and base	Reinforced concrete C40/50 in accordance with BS 8500-1 and BS EN 206-1. B500B Steel reinforcement in accordance with BS 4449 and BS EN 10080	Concrete finish to stem class F4. Exposure classes XD3, XC3/XC/4, XF4, DS2 with nominal cover = 50mm for min 100 years design working life in accordance with BS 8500:2015-Part 1 (Tables A1-A5). Concrete finish to base class F1. Exposure classes XD3, XC3/XC/4, XF4, DS2 with nominal cover = 50mm for min 100 years design working life in accordance with BS 8500:2015-Part 1 (Tables A1-A5).
Parapet wall	Existing Stone Wall 1.20m high and 0.45m thick	Existing stone.
Backfill material	No Fines Concrete	Backfill to rear of burr wall.
Drainage (for retaining walls)	Provision of 100mm dia. PVC perforated longitudinal drain behind the wall taken to a suitable outfall together with 38mm dia. weep pipes at 2m max. centres.	Located above the heel and surrounded in No Fines concrete .
Waterproofing to RC burr wall	Liquid applied DPM to provide additional protection to concrete.	Rear face of stem and top and sides of base (to increase the design working life of the RC burr wall to 120 years).
Masonry facework and coping stones	Site reclaimed stonework with new coping stones to match existing sandstone as architects' details.	To internal car park side elevation. Masonry to be tied to concrete wall by the use of cast-in Halfen wall starters or similar.
Movement Joints	Compressible joint filler with mastic sealant (e.g. Aerofil 1 with Vertiseal sealant).	In stone facing wall at 6m max centres.

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

The Principal Designer is Walker Wood Associates. We can confirm that they have reviewed the risks and hazards identified in this AIP and are satisfied.

The following hazards (but not exclusively) were considered :

- Working close to the highway with live vehicular traffic
- Stability of the existing highway
- Existing utility/unchartered services within the highway/ private land
- Working at height
- Deep Excavation

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)

The estimated cost of the works is £60,000. The proposed reinforced concrete wall is the most efficient design for the loading which will be applied

3.14. Proposed arrangements for construction

3.14.1. Construction of structure

The structure will be constructed in the following way.

The existing masonry boundary wall will be carefully reduced in height to leave a 1.2m high parapet with all stone retained for re-use.

Sheet piles or alternative temporary works will be installed to provide a safe working environment for the site operatives.

Weep holes to be provided at 2.0m centres. Perforated land drain provided to rear of wall immediately above the heel and taken to a suitable outfall within the site.

The base then the stem of the wall will be constructed, and the rear face of the wall will receive an applied DPM prior to placing backfill together with a suitable land drain behind the wall.

3.14.2. Traffic management

All traffic management to be agreed with the Kirklees Council's Highways Street works section prior to the start of works.

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3.14.3. Service diversions

Utilities plans have been obtained and added to a site wide demolition drawing. Trial pits will be carried out prior to works commencing on site.

3.14.4. Interface with existing structures

N/A

3.15. Resilience and security

None

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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 and the national annex.

Loading will be applied and combined in accordance with BS EN 1990 and BS EN 1991 as amended by the relevant national annex for both ULS and SLS.

<i>Source</i>	<i>Unit Weight (kN/m³)</i>
<i>Concrete</i>	25
<i>Fill Material</i>	20

Hydrostatic pressure – Not applicable

4.1.2. Snow, Wind and Thermal actions

Snow & Wind loading, and thermal actions not considered.

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

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

4.1.4. Actions relating to General Order traffic under STGO regulations

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

4.1.5. Footway or footbridge variable actions

5kN/m² 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

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4.1.7. Accidental actions

Accidental actions to be in accordance with 4.7.3.1 of BS EN 1991-2 and National Annex to BS EN 1991-2. Vehicle restraint system in the form of a masonry parapet (1.20m high) to provide N1 level of containment in accordance with BS EN 1317-2:1998. Refer to Designer's Risk Assessment attached to this form.

4.1.8. Action during construction

The proposed 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.

4.2. Proposed minimum headroom provided

N/A

4.3. Authorities consulted and any special conditions required

Kirklees Council Highways. No special conditions required.

4.4. Standards and documents listed in the Technical Approval Schedule

TAS dated 16 July 2021 - See appendix A.

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

None

4.5. Proposed departures from standards listed in 4.5

None

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

Due to the proposed burr wall being located at the back of a wide footway, and as it is highly unlikely that an abnormal load movement would be routed over the footway, a departure from the approved standard BS 8002:2015 is proposed whereby the surcharge loading on the highway has been reduced to 20kN/m²

The proposed RC burr wall will be a private structure and as such its maintenance liability will solely rest with the adjoining land title holder/s. This will need to be shown on the land registry title deeds and plans for the new Aldi Store. A copy of the land registry deed document will be sent the Council's Highway Structures section for record purposes.

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4.7. Proposed safety critical fixings

None

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.

Reinforced concrete burr wall to be analysed and designed using Master Series software with sense checks by hand

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

Reinforced Concrete burr wall with masonry face.

Details of the proposed retaining wall are indicated on 3e drawings SL_90_40_46-0001-C01 and Ss _20_05_15-0003-C03.

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

Structural element stiffness is based upon the dimensions and gross uncracked cross-sectional areas entered within the MasterSeries design calculation.

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

Parameters used:

$K_a = 0.3$

$\emptyset = 30^\circ$

$\delta = 35^\circ$

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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 ground investigation report has been reviewed and the information used in the design.

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

Based on the ground investigation report findings, the wall foundations will be founded on competent natural strata with an allowable bearing capacity of 150kN/m² and no significant movement is anticipated.

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

Founded on similar material throughout and differential settlement is not considered a significant issue.

- 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 check required

DSL2 relating to RC2

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

A separate AiP for a Type P proposal is to be provided by the temporary works designer for the design of the sheet piled walls

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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
Ss_20_05_15_0003 C03	Detail of Proposed Burr Wall to Northern Boundary

8.1.2. Documents (See appendix C)

Reference	Title
P18-365-3E-ZZ-ZZ-RP-G-9001	Phase II Site Investigation Report

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9. THE ABOVE IS SUBMITTED FOR ACCEPTANCE

Design Team Leader

Signed _____

Name

Adrian Batey

Engineering Qualifications

BSc(Hons) CEng MIStructE

Name of Organisation

3e Consulting Engineers

Date

18/03/22

Check Team Leader

Signed _____

Name

Dean Gray

Engineering Qualifications

BEng(Hons)

Name of Organisation

3e Consulting Engineers

Date

18/03/22

**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 November 2021)

The Designer is responsible for ensuring that the standards and references given in the schedule are correct and up to date.

Tick all the documents used (✓)

Eurocodes and associated UK National Annexes				
Used	Reference	Title	Amendment / Corrigenda	
	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	-	
✓	BS EN 1991-1-7:2006 +A1:2014	Eurocode 1: Actions on structures. General Actions. Accidental actions	+A1: 2014 Corrigendum February 2010	

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Eurocodes and associated UK National Annexes				
Used	Reference	Title	Amendment / Corrigenda	
✓	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	-	
	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	-	

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Used	Reference	Title	Amendment / Corrigenda	
	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		
	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	

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Eurocodes and associated UK National Annexes				
Used	Reference	Title	Amendment / Corrigenda	
	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	
✓	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	

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Eurocodes and associated UK National Annexes				
Used	Reference	Title	Amendment / Corrigenda	
	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 <i>Design of aluminium structures</i>				
	BS EN 1999-1-1:2007 + A2:2013	Eurocode 9: Design of aluminium structures – Part 1-1 General structural rules	+ A2:2013 Incorporating corrigendum March 2014	
	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	
✓	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	

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BSI Published Documents

Used	Reference	Title	
✓	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	
	BS EN 1317-2:2010	Road Restraint Systems – Part 2 – Performance classes, impact test acceptance criteria and test methods for safety barriers.	
	BS EN 1317-3:2010	Road Restraint Systems – Part 3 – Performance classes, impact test acceptance criteria and test methods for crash cushions.	
	DD ENV 1317-4:2002	Road Restraint Systems – Part 4 – Performance classes, impact test acceptance criteria and test methods for terminals and transitions of safety barriers.	<i>Draft BS EN 1317-4 for public comment published in June 2012</i>

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Product Standards referenced in British Standards or Eurocodes			
Used	Reference	Title	
	BS EN 1317-5:2007+A2:2012	Road Restraint Systems – Part 5 - Product requirements and evaluation of conformity for vehicle restraint systems	<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/TS 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.	
	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	

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Product Standards referenced in British Standards or Eurocodes			
Used	Reference	Title	
	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.	
✓	BS 8666:2005	Scheduling, dimensioning, bending and cutting of steel reinforcement for concrete	Incorporating Amendment No.1

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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>
	CD 354	Design of minor structures	<i>(Formerly known as BD 94/ 17 and replace BD94/17)</i>
	CD 355	Application of whole-life cost of design and maintenance of highway structures	<i>(Formerly known as BD 36/92 & BA 28/92)</i>
	CD 356	Design of Highway structure for hydraulic action	<i>(Formerly known as BA 59/94)</i>
	CD 357	Bridge expansion joints	<i>(Formerly known as BD33/94, BA26/94, IAN168/12, IAN169/12)</i>

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The Design Manual for Roads and Bridges (DMRB)			
Used	Reference	Title	
	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))
	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)

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

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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
	DfT Bridge Owners Forum	Guidance on the Design, Assessment and Strengthening of Masonry Parapets on Highway Structures	

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APPENDIX B

DRAWINGS

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APPENDIX C

ADDITIONAL INFORMATION