
Procedures

Procedures for the Structural Approval of Retaining Walls, Bridges and Culverts adjacent to or on the Highway.

1 Introduction

Structures which are to be built adjacent to or under the highway by a private individual/company, developer or other local authority may require structural approval by Oxfordshire County Council as Highway Authority.

The following exceptions apply:

- For structures adjacent to the following trunk roads and motorways within Oxfordshire, structural approval will be given by the Highways Agency. Telephone 0645 556575 for further information.

M40	Within Oxfordshire
A34	County Boundary to M40 Interchange
A43	M40 junction to County Boundary

These notes set out the procedure to be adopted, the documentation required and the criteria that must be satisfied prior to work commencing on site.

2. Adoption of Structures by the County Council

Certain structures adjacent or under the highway may be adopted by the County Council. In normal circumstances, the only structures that will be considered for adoption are those upon which the Highway relies for support, and are constructed on Highway Land (or land to be adopted as Highway Land).

All structures to be adopted should have received Structural Approval in accordance with Section 4.0 of this document.

3. Approval of Structures not to be adopted by the County Council

The following structures not adoptable by the County Council require Structural Approval in accordance with Section 4.0 of this document.

- Any wall or basement constructed on private land by an individual or developer which affects the support of the highway.
- Bridges crossing the Highway where there is no public access to the bridge.
- Retaining walls where any part of the retaining wall is 1.37m above the boundary of the highway nearest that point.
- Structures over 0.9 m span (diameter) carrying sewage.

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4. Procedure to be followed

See flow chart for procedure. It should be noted that up to four weeks should be allowed for the approval of calculations and drawings. If the documents are inadequate an extension to this time may be required.

All required information to be submitted to:

Bridges Section - Environmental Services
Oxfordshire County Council
Speedwell House
Speedwell Street
OXFORD OX1 1NE

Telephone: 01865 815641 (direct line)

5. Information and documentation to be submitted for structural approval

- Site Plan, showing the location and extent of all structures and in the case of walls detailing lengths to be adopted and/or over 1.37m high if applicable.
- Sufficient details to determine wall heights, giving ground levels, behind and in front of wall and any features affecting loading such as cover to culverts.
- Clearances to deck soffit and piers/abutments shall be submitted for bridges
- Site investigation details and geotechnical assumptions on which the design has been based. This must be given in sufficient detail on the drawing to allow the designers assumptions to be compared with the conditions actually found on site by those responsible for construction.
- Construction details and material specifications.
- Design calculations with full reference to the design standards used.
- *For structures that are to be adopted or for structures upon which the Highway relies for support:* Design and Construction Certificates and "As Built" Drawings. See section 6.0 for further details.

6. Design and Construction Certificates

Design and Construction Certificates are required if the structure is to be adopted or for structures upon which the Highway relies for support. These certificates must be in the form given in Appendix A to these notes and must be submitted at the appropriate stage. The position in the organisation of signatories and their qualifications must be stated. If a section of the work is undertaken by another party, such as a precast concrete supplier, then it would be appropriate for that party to take responsibility for his section of the work, and complete a separate Certificate.

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7. Bridge Maintenance Manual / Health and Safety File

On completion of the work the Developer must provide a Bridge Maintenance Manual containing:

- details of the materials used in construction and the supplier;
- requirements for future maintenance;
- any survey and geotechnical details undertaken on the site of the structure;
- details of problems encountered during construction that may have a long term effect on the structure;
- information relating to any services or public utilities on or in the vicinity of the structure;
- any access arrangements for future maintenance;
- As built drawings as electronic TIF files or AutoCAD files.
- Design Calculations.
- Special arrangements that may be required for demolition

The provision of the above information will provide the information that you have to legally provide under the Construction Design and Management (CDM) Regulations. Please discuss the form of this information with the Bridge Office.

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Design Certificate

To be completed by the Design Engineer before construction commences. More than one certificate may be submitted if parts of the structure have separate designers.

We certify that reasonable professional skill and care has been used in the design of
..... (name of structure) with a view to securing that:

- (i) It has been designed in accordance with the design documents listed in Schedule A attached*. The live loads are as follows
.....
- (ii) The design has accurately been translated into contract drawings. The unique numbers of these drawings (copies of which are attached) are:
.....
- (iii) Departures from standards and additional criteria which have been approved by Oxfordshire County Council are listed in Schedule B attached*.

SIGNED: _____ DATE _____
NAME: _____
POSITION HELD:
(Design Team Leader)**

SIGNED: _____ DATE _____
NAME: _____
POSITION HELD:
(Partner or Director)**

NOTES:

**(1) The County Council should be consulted to ensure appropriate documents are used.
Notes for guidance are available to cover simple structures.*

*** (2) The position, qualification and employing organisation of each person signing the certificate shall be stated.*

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Construction Certificate

To be submitted by the developer when construction is complete, before adoption of the structure

We certify that:

(1) (name of structure) has been constructed* in accordance with the 'As built' drawings, (copies attached) the unique numbers of which are as follows:

.....

(2) Departures from the drawings submitted with the design certificate have been approved by Oxfordshire County council and are listed in Schedule C attached.

SIGNED: _____ DATE _____

NAME: _____

POSITION HELD:

(Director)**

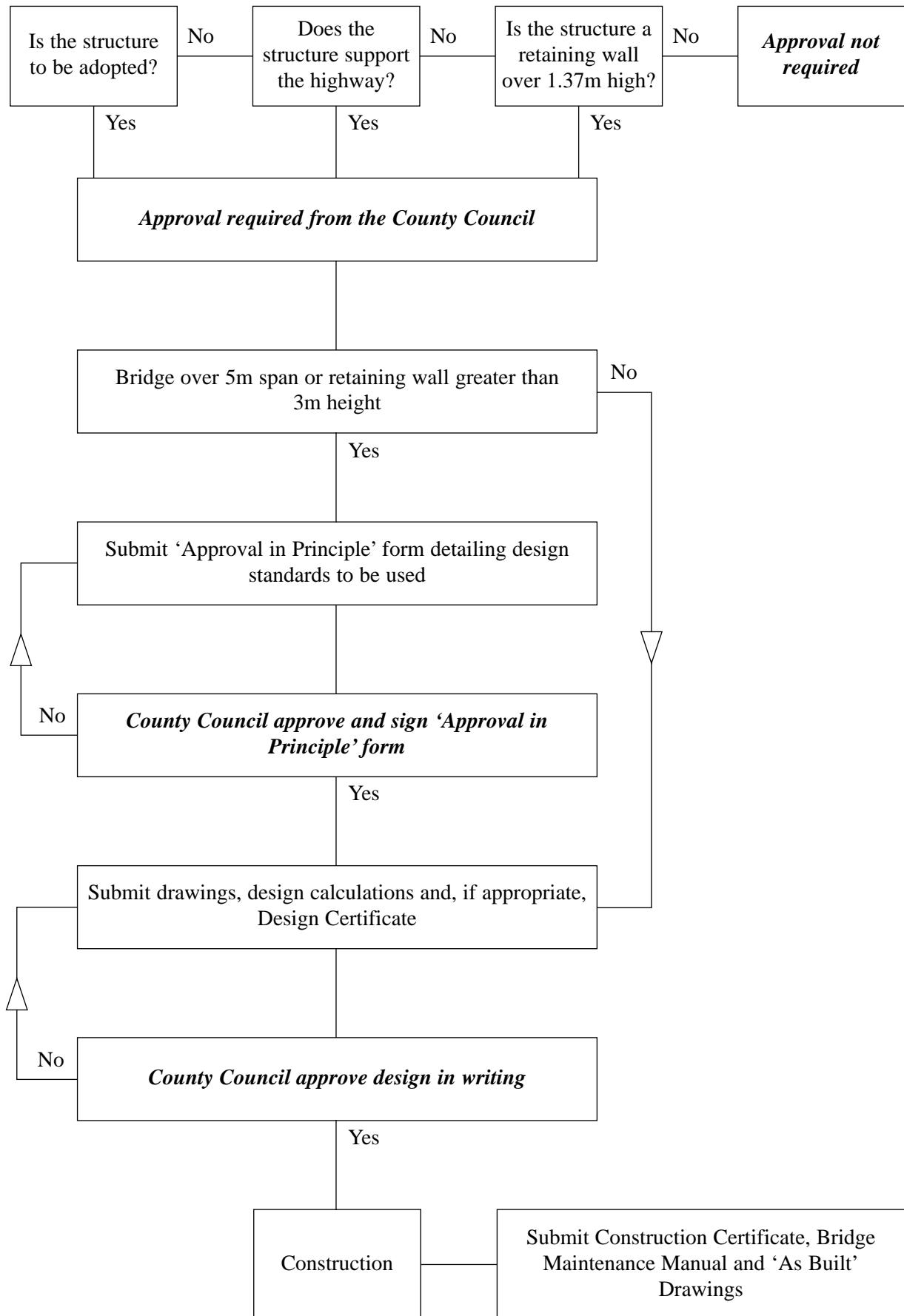
NOTES:

**(1) This undertaking does not absolve the developer or contractor from the need to notify the County Council of progress on site sufficient to enable inspection of all critical stages.*

*** (2) The position, qualification and employing organisation of each person signing the certificate shall be stated.*

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Appendix B: Obtaining approval for structures adjacent to the highway



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Notes for Guidance - Culverts and Simple Bridges.

Design Standards for Culverts and Simple Bridges submitted to the County Council for Approval and/or Adoption

1. Definitions

For the purposes of this note:

A *culvert* is a concrete pipe or a precast concrete box with a span of between 0.9m and 1.5m.

A *simple bridge* includes the following bridges up to a maximum span of 5m

- Reinforced concrete slab
- Simply supported steel beam / reinforced concrete slab deck
- Simply supported pre-stressed concrete beam deck
- Pre-cast Concrete Box
- A corrugated steel buried structure.
- Simple timber or timber/steel footbridges (up to 10m span)

A *buried structure* has a depth of cover from finished road surface to top of structure of greater than 600mm

2. General Information

Designs shall comply with the documents listed in:

- Schedule 1 for buried structures and corrugated steel buried structures;
- Schedule 2 for culverts and simple bridges

These separately list alternative sets of design standards that are currently permitted, as summarised in Table 1. Any departures from this list or additions are to be agreed with the Bridge Office of Oxfordshire County Council Environmental Services.

The basis for geotechnical assumptions, such as permissible bearing pressures and backfill pressures shall be clearly stated.

A summary of the live loading required by has been extracted from Table 1 in BD37/88 and is repeated in Table 2 of this note.

Partial safety factors γ_{fl} shall be applied to all loads in Table 1 in BD 37/88, these factors are reproduced in Table 1 of this note. For concrete structures the value of partial safety factor γ_{f3} as found in Clauses 4.2.2 and 4.2.3 of BS5400 : Part 4 shall be taken as 1.1 for ULS and 1.0 for SLS.

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Full Technical Approval in accordance with BD2/89 is required for structures with a span of greater than 5m. These structures should be designed in accordance with current HA memoranda and the appropriate British Standards - consult the bridge office for further details.

3. Design and Specification

The design and specification shall be such as to ensure that a durable structure requiring minimum maintenance is constructed. For example:

- dpc bricks shall be used at ground level;
- bricks shall be designation FL to BS 3921 or designation FN if sulphate resisting cement is used
- movement joints are to be avoided wherever possible by the use of integral structures;
- permeable backing of abutment walls shall be provided with weep pipes at 3 m. centres.
- timber members shall not be in direct contact with the ground

Culverts shall be supported on a granular bed of minimum thickness 200 mm. The bedding material shall be single size aggregate to BS 882 with an angular or irregular shape, passing a 40 mm sieve and retained on a 5 mm sieve. In addition, it is necessary to prevent intrusion of fine grained soils

To conform to the County Council's policy on only using timber from renewable sources, the use of Tropical Hardwoods such as Ekki and Greenheart must be from a source approved by the Forestry Stewardship Council (UK). See their website on www.fsc-uk.info for more information.

Foot and Bridleway bridges should have a non slip surfacing. The use of encapsulated plywood panels such as Acme panels by Rocol Safety Systems is preferred. The use of grooved timber planks has not proved satisfactory and will not be acceptable for structures to be adopted.

4. Parapets

If the parapet is required to contain vehicles or pedestrians it shall be designed to the following standards as given in Highways Agency Technical Memorandum BD 52/93 General Requirements for Highway Bridge Parapets;

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Principal Roads	P2	50kN transverse force to be applied to posts
Footbridges/Bridleways	P4	1400N/m acting separately in transverse and vertical directions.
Over Railways	P6	See BD 52/93. Railtrack may have other requirements dependent on location.

In residential areas with a speed limit of 30 mph or less the preferred type of parapet is a Steel P2 Vertical Infill Parapet. The bridge office should be consulted on the use of non-standard balustrades and parapets.

On footbridges carrying bridleways and cycle tracks the parapets to be 1.4m high.

5. Waterproofing

Bitumen waterproofing shall be applied to rear faces of walls and all concrete more than 150mm. below ground level.

An approved waterproof membrane shall be applied to decks and the top of culverts, lapped down the sides by 500mm minimum. If the surfacing is to be laid direct onto the waterproofing, the waterproofing membrane shall comply with Highway Agency Standard BD 47/99.

TABLE 1: Summary of Loading and Design Standards

Structure Type	Design Code
Buried Structures of span or internal diameter 0.9 metres or less	Simplified tables of external loads on buried pipe lines
Buried Structures of span or internal diameter 0.9 metres or more and depth of fill greater than 0.6 metres	Loads: Design: BD 37/88 Design: BD 31/87 and BS 5400 Part 4 (concrete) BD 12/95 and Type approval certificate (steel) Dispersal of loads through fill in accordance with BD 31/87 or BD 12/95 See Tables 2.1, 2.2 and Schedule 1
Culverts and bridges of span between 0.9 m. and 5 m. and depth of fill less than 0.6 metres.	Loads: BD 37 Design: BS 5400 Part 3 (steel) BS 5400 Part 4 (concrete) BS 5400 Part 5 (composite) See Tables 2.1, 2.2 and Schedule 2

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TABLE 2.1: Values of γ_{fi} for Principal Loads

The worst combination of the loads below shall be considered. These loads include all those that need to be normally considered for simple bridges, culverts and other similar structures

Load		Factor γ_{fi}	
		ULS	SLS
Dead Load	Steel	1.05	1.0
	Concrete	1.15	1.0
Superimposed Dead	Deck Surfacing	1.75	1.2
	Other Loads	1.2	1.0
Earth Pressure	Retained Fill and/or Live Load Surcharge	1.5	1.0
	Any relieving effect	1.0	-
Live (to be considered independently to other live load loading)	HA alone	1.5	1.2
	HB alone or HA with HB	1.3	1.1
	Foot/cycle track bridges	1.5	1.0
	Parapet loads - bridleways and footbridges	1.5	1.0
	Parapet loads - Vehicular Bridges	1.0 *	1.0
	Accidental Wheel Loading	1.5	1.2

* $\gamma_{f3} = 1.0$ for this case only

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TABLE 2.2: Live Loading to be applied to Culverts and Simple Bridges in accordance with BD 37/88

1. Mandatory for all Structures where the fill depth is less than 0.6 metres.
2. Where fill depth exceeds 0.6 metres, HA and HB wheel loads shall be dispersed through the fill in accordance with BD 31 (CI 4.7.2) or for corrugated steel structures BD 12 (CI 3.5).
3. Clause numbers in the table relate to BD 37/88.

Vertical Loads

Class of Route	Column 1 HA Loading applied to notional lane of carriageway (CI 3.2.9.3)	Column 2 HB Loading applied to notional lane of carriageway (CI 3.2.9.3)	Column 3 Normal loading verge, footway	Column 4 Local effects of live loading on
Principal roads	See Table 2.3	45 Unit HB Vehicle (CI 6.3) See Table 2.4	4 kN/m ² (CI 6.5.1.2)	Accidental Wheel (CI 6.6) See Table 2.3
Other public roads	As above	30 Unit HP Vehicle See Table 2.4	As above	As above
Accommodation roads, private roads and all trafficked locations	As above	25 Unit HP Vehicle See Table 2.4	As above	As above
Bridleways and footpaths No vehicles	-	-	5 kN/m ² (CI 7.11)	-

Notes

1. Application of Loads: The following live load combinations shall be considered:
 - Loads in Column 1 plus Column 3
 - Loads in Column 2 plus Column 3
 - Loads in Column 4 (for design of members for local effects)

Horizontal Loads

Apply loads in accordance with CI 6.10 of BD 37:

1. HA: 250 kN + 8 kN/m of loaded length, applied over an area 1 notional lane width x loaded length.
2. HB: 25% of HB nominal load equally distributed between 8 wheels of 2 axles of HB vehicle 1.8 m apart.
3. Disregard live load horizontal forces if fill depth exceeds span (CI 4.8 BD 31)
4. For buried concrete box type structures longitudinal loads and accidental skidding loads need only to be considered with HB loading (CI 4.8 BD 31/87)

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Table 2.3: HA Loading

UDL 'x' kN / metre of lane as given below (Cl 6.2.1)

KEL 120 kN / lane (Cl 6.2.2)

Or

100 kN wheel applied separately for the checking of local effects (Cl 6.2.5), dispersed in accordance with Cl 6.2.6

HA 'UDL' Loading

Loaded Length (L)	Load (W)
metre	kN/m
2.0	211.2
2.5	181.9
3.0	160.9
3.5	145.1
4.0	132.7
4.5	122.7
5.0	114.3

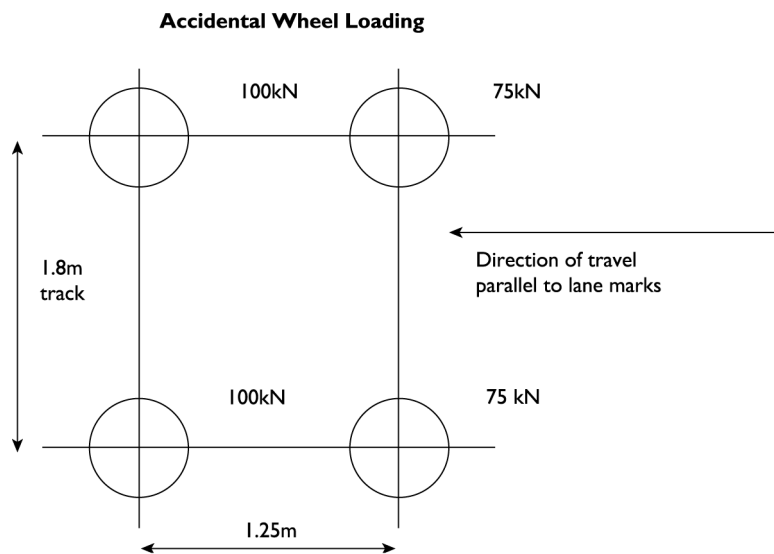


Table derived from the equation:

$$W = 336 (1 / L)^{0.67}$$

1. HA 'UDL' Loading extracted from BD 37 Table 13 (Cl 6.2.1)
2. Accidental Wheel Loading extracted from BD 37 Fig 14 (Cl 6.6)

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Schedule 1: Buried Structures

Schedule of Documents to be used for the design of buried structures beneath highways with a cover greater than 0.6 metres but less than 8 metres.

British Standards

- BS 5400 Part 1: 1988 General Statement, Steel, Concrete and Composite Bridges
Part 4: 1990 Code of Practice for the design of Concrete Bridges
- BS 6031 : 1981 Earthworks
- BS 8002 : 1994 Earth Retaining Structures
- BS 8004 : 1986 Foundations

Highways Agency Technical Memorandum

- BD 12 Design of Corrugated Steel Buried Structures with Spans greater than 0.9 metres and up to 8 metres
- BD 15 The use of BS 5400 Part 1 : 1988
- BD 24 The use of BS 5400 Part 4 : 1990
- BD 30 Backfilled Retaining Walls and Bridge Abutments
- BD 31 The Design of Buried Concrete Box and Portal Frame Structures
- BD 37 Loads for Highway Bridges
- BA 41 The Design and Appearance of Bridges - Advice Note
- BD 42 Design of Embedded Retaining Walls and Buried Structures
- BD 52 The Design of Highway Bridge Parapets
- BD 57 Design for Durability
- BA 57 Design for Durability - Advice Note
- BD 70 Strengthened and Reinforced Soils and Other Fills for Retaining Walls and Bridge Abutments

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<http://www.archive.official-documents.co.uk/document/ha/dmrb/index.htm>

Where the standard has been superseded the latest version should normally be used

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Schedule 2: Culverts and Simple Bridges

Schedule of Documents to be used for the design of culverts with less than 0.6 metres cover, and small bridges up to 10 metres span.

British Standards

BS 5400 Part 1: 1988 General Statement, Steel, Concrete and Composite Bridges

Part 3: 1982 Code of Practice for the design of Steel Bridges

Part 4: 1990 Code of Practice for the design of Concrete Bridges

Part 5: 1979 Code of Practice for the design of Composite Bridges

BS 6031 : 1981 Earthworks

BS 8002 : 1994 Earth Retaining Structures

BS 8004 : 1986 Foundations

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BD 13 The use of BS 5400 Part 3 : 1982

BD 15 The use of BS 5400 Part 1 : 1988

BD 16 The use of BS 5400 Part 5 : 1988

BD 24 The use of BS 5400 Part 4 : 1990

BD 30 Backfilled Retaining Walls and Bridge Abutments

BD 33 Expansion Joints for use in Highway Bridge Decks

BD 37 Loads for Highway Bridges

BA 42 The Design of Integral Bridges

BD 47 Waterproofing and Surfacing of Concrete Bridge Decks

BA 47 Waterproofing and Surfacing of Concrete Bridge Decks - Advice Note

BD 52 The Design of Highway Bridge Parapets

BD 57 Design for Durability

BA 57 Design for Durability - Advice Note

BD 70 Strengthened and Reinforced Soils and Other Fills for Retaining Walls and Bridge Abutments

BD 74 Foundations

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<http://www.archive.official-documents.co.uk/document/ha/dmrb/index.htm>

Where the standard has been superseded the latest version should normally be used.

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Notes for Guidance - Earth Retaining Structures

Design Standards for Earth Retaining Structures submitted to the County Council for Approval and/or Adoption

1. Definitions

For the purposes of this note:

A retaining wall is any wall that retains greater than 0.9m of fill material generally or when the highway is supported greater than 0.5m of fill.

A backfilled retaining wall can be either mass or cantilever construction and is backfilled after construction. An embedded retaining wall such as steel sheet piling supports undisturbed ground.

A crib retaining wall is built of individual elements to form a series of box like cells into which infill is placed, the infill acting as an integral part of the structure.

A Gabion Wall comprises rectangular steel baskets filled with selected rock to form a mass retaining wall.

In reinforced earth the fill is strengthened with reinforcement of either metal or composite material placed in layers to form a unified mass.

2. General Information

Designs shall comply with the documents listed in Schedule 3. Any departures from this list or additions are to be agreed with the Bridge Office of Oxfordshire County Council Environmental Services.

The basis for geotechnical assumptions, such as permissible bearing pressures and backfill pressures shall be clearly stated.

A summary of the live loading required by Table 1 in BD37 has been extracted and repeated in Table 2 of this note. A Minimum Surcharge Loading of 10 kN/m² is required behind all retaining walls (cl 3.3.4.1 BS 8002)

Partial safety factors γ_{fl} shall be applied to all loads in Table 1 in BD 37, these factors are reproduced in Table 1 of this note. For concrete structures the value of partial safety factor γ_{f3} as found in Clauses 4.2.2 and 4.2.3 of BS5400 : Part 4 shall be taken as 1.1 for ULS and 1.0 for SLS.

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3. Design and Specification

The design and specification shall be such as to ensure that a durable structure requiring minimum maintenance is constructed. For example:

- dpc bricks shall be used at ground level;
- bricks shall be designation FL to BS 3921 or designation FN if sulphate resisting cement is used;
- bitumen waterproofing shall be applied to rear faces of walls;
- permeable backing of the wall shall be provided with weep pipes at 3 m. centres.

4. Parapets

If the parapet is required to contain vehicles or pedestrians it shall be designed to the following standards as given in Highways Agency Technical Memorandum BD 52 General Requirements for Highway Bridge Parapets;

Principal Roads	P2	50kN transverse force to be applied to posts
Footbridges/Bridleways	P4	1400N/m acting separately in transverse and vertical directions.
Over Railways	P6	See BD 52. Railtrack may have other requirements dependent on location.

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Table 1 - Summary of Loading and Design Standards

Structure type	Design Code
Mass Concrete or masonry walls less than 0.9 m retained height	BS 8002
Embedded Retaining Walls: <ul style="list-style-type: none"> • Sheet pile • Contiguous concrete pile 	Loads: BD 37/88 Design: BD 42/00 See Tables 2.1, 2.2 and Schedule 3
Reinforced Earth Retaining Walls	Loads: BD 37/88 Design: BD70/97 BBA Certification required
Gabion Walling	Loads: BD 37/88 Design: BS 8002 BBA Certification required
Crib Walling	Loads: BD 37/88 Design: BD 68/97 BBA Certification required
Reinforced Concrete Cantilever walls	Loads: BD 37/88 Design: BD 30/87 and BS 5400 Part 4 (concrete) See Tables 2.1, 2.2 and Schedule 3

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Table 2.1 - Values of γ_{fi} for Principal Loads

The worst combination of the loads below shall be considered. These loads include all those that need to be normally considered for simple retaining walls.

Load		Factor γ_{fi}	
		ULS	SLS
Dead Load	Steel	1.05	1.0
	Concrete	1.15	1.0
Earth Pressure	Retained Fill and/or Live Load Surcharge	1.5	1.0
	Any relieving effect	1.0	-
Live	HA alone	1.5	1.2
	HB alone or HA with HB	1.3	1.1
	Parapet loads - bridleways and footbridges	1.5	1.0
	Parapet loads - Vehicular Bridges	1.0*	1.0

$\gamma_{f3} = 1.0$ for this case only

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Table 2.2 - Live Loading to be applied to Earth Retaining Structures adjacent to or supporting the highway

Lane Use of Upper Level	Column 1 HA Loading applied on Carriageway	Column 2 HB Loading applied on Carriageway
Principal Roads	10 kN/m ₂	45 Unit HB Vehicle: 20 kN/m ²
Other Public Roads	10 kN/m ₂	30 Unit HB Vehicle: 12 kN/m ²
Accommodation Roads, Private Roads and all trafficked locations	10 kN/m ₂	25 Unit HB Vehicle: 12 kN/m ²
Footway liable to be trafficked	5 kN/m ₂	

Notes

1. Application of Loads: The following live load combinations shall be considered:
 - Loads in Column 1 plus Minimum Surcharge Loading of 5 kN/m²
 - Loads in Column 2 plus Minimum Surcharge Loading of 5 kN/m²

2. The live loadings given in the above table are extracted from BD 37, Clauses as follows:
 - HA Loads Clause 5.8.2.1
 - HB Loads Clause 5.8.2.1
 - Footway Clause 7.1.1

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Schedule 3 - Earth retaining Structures

Schedule of Documents to be used for the design of Earth retaining structures adjacent to Highways

British Standards

- BS 5400 Part 1 : 1988 General Statement, Steel, Concrete and Composite Bridges
Part 4 : 1990 Code of Practice for the design of Concrete Bridges
- BS 5628 Part 1 : 1992 Unreinforced Masonry. (Amendment 1985)
Part 2 : 1995 Reinforced and Prestressed Masonry
Part 3 : 1985 Materials and Components, Design and Workmanship
- BS 6031 : 1981 Earthworks
- BS 8002 : 1994 Earth Retaining Structures
- BS 8004 : 1986 Foundations
- BS 8110 : 1985 Design of Reinforced Concrete

Highways Agency Technical Memorandum

- BD 15/92 The use of BS 5400 Part 1 : 1988
- BD 24/92 The use of BS 5400 Part 4 : 1990
- BD 30/87 Backfilled Retaining Walls and Bridge Abutments
- BD 37/01 Loads for Highway Bridges
- BD 41/97 Reinforced Clay Brickwork Retaining Walls of Pocket Type and Grouted Cavity Type Construction. Use of BS 5628 : Part 2
- BD 42/00 Design of Embedded Retaining Walls and Bridge Abutments
- BA 48/93 Pedestrian Protection at Head Walls, Wing Walls and Retaining Walls.
- BD 57/01 Design for Durability
- BA 57/01 Design for Durability - Advice Note
- BD 68/97 Crib Retaining Walls
- BA 68/97 Crib Retaining Walls - Advice Note
- BD 70/97 Strengthened and Reinforced Soils and Other Fills for Retaining Walls and Bridge Abutments
- BD 74/00 Foundations

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