The Lake Lothing (Lowestoft) Third Crossing Order 201[*]

Lake Lothing THIRD CROSSING

Document 7.5: Design Report

Appendix 4

Author: Suffolk County Council

Lake Lothing Third Crossing Outline Approval in Principle for Riverside Road Access Portal Frame

Bridge Ref 10/68

Bridge Code 6730

December 2017

Produced for
Suffolk County Council

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Name of Structure: **Lake Lothing Third Crossing Riverside Road Access Portal Frame**

INTRODUCTION

Lake Lothing in Lowestoft, Suffolk is currently crossed by two road bridges, A47 Bascule Bridge carrying the A12 across the passage between the inner and outer harbours and the Mutford Bridge carrying the A1117 at Oulton Broad. Both crossings open to allow shipping to access the port causing significant traffic disruption. The proposed LL3X is a new road crossing over Lake Lothing, improving connectivity between both sides of the lake as well as relieving congestion in and around the town centre. The proposed bridge will comprise a central bascule river span, approach viaducts to both side and a portal frame structure for access to Nexen building.

The main obstacles crossed by the LL3X are the Lake Lothing and the East Suffolk Line.

This Outline Approval in Principle contains information about the design of the portal frame structure for access to Nexen building only. The central bascule span and the approach viaducts are covered by two separate Outline Approval in Principle documents.

1 HIGHWAY DETAILS

1.1 Type of highway

Over: Single carriageway 2-lane A Class all-purpose road carried by approach viaducts.

Under: Riverside Road, single carriageway

1.2 Permitted traffic speed

Over: 30 mph.

Under: 30 mph.

1.3 Existing restrictions

Not Applicable

2 SITE DETAILS

2.1 Obstacles crossed

Access road to private land.

3 PROPOSED STRUCTURE

3.1 Description of structure and design working life

The LL3X portal frame will be a single span structure, carrying the new LL3X road. The total span length will be approximately 20m (clear span between abutment faces). The deck will have a constant width of 19.26m. The bridge will have a straight horizontal alignment. Vertically the bridge will have a longitudinal fall towards the south. The abutments will be skewed to the centreline of the carriageway at approximately 8 degrees.

The proposed cross section over the structure consists of the following:

Parapet plinth	0.73m
East verge	4.5m
Carriageway (2 No. lanes)	7.3m
West verge NMU route	6.0m
Parapet plinth	0.73m

The proposed cross section under the structure consists of the following:

North verge	2m
Carriageway (2 No. lanes)	7.3m
South verge	2m

For more details of the proposed structure refer to drawings in Appendix B.

The superstructure shall comprise an in situ deck acting compositely with pre-cast pre-stressed concrete beams

The parapets will be supported by an in-situ reinforced concrete edge beam.

The abutments will be supported on reinforced concrete piled foundations. The reinforced earth structure will butt against the abutments. The reinforced earth structure details are covered in the separate SEAF document.

The bridge shall be designed to have a design working life category 5 (≥120 years) in accordance with NA to BS EN 1990:2002. Waterproofing systems, parapets and safety barriers shall be a design working life category 2 (up to 50 years).

3.2 Structural type

The proposed structure will be a single span fully integral overbridge. The superstructure shall comprise of 24 No. TY pre-cast pre-stressed concrete beams, acting compositely with an in-situ reinforced concrete deck. An integral connection between the abutments and deck will be achieved via in-situ reinforced concrete diaphragms. The pre-cast beams will be laterally spaced at 750 mm centres.

3.3 Foundation type

The abutments will be supported on reinforced concrete piled foundations.

3.4 Span arrangements

The span arrangements are as stated below, the clear span are measured between the abutment faces

Portal Frame span: 20m

3.5 Articulation arrangements

The bridge deck is made fully integral with the abutments and no bearings are provided.

3.6 Classes and levels

3.6.1 *Consequence class*

The Consequence Class for the whole structure is CC2.

3.6.2 *Reliability class*

The Reliability Class is RC2

3.6.3 *Inspection level*

The Inspection Level during execution is IL2.

3.7 Road restraint systems requirements

Parapets will be 1.4m high for N2 parapets. Transitions between safety barriers and parapets shall be provided in accordance with DD ENV 1317-4.

3.8 Proposed arrangements for future maintenance and inspection

The structure will be subject to regular General and Principal Inspections in line with Suffolk County Council's agreed programme of inspection. The bridge is low maintenance with no bearings. Inspections may be carried out either on foot, by mobile elevated working platform or by the use of an underbridge unit parked on the carriageway or cycleway.

3.8.1 Traffic management

Lane closures will be needed on the access road if a mobile elevated working platform is used for close inspection of the underside of the structure.

3.8.2 *Arrangements for future maintenance and inspection of the structure access arrangements to structure.*

Access for inspection of the bridge soffit will be via an underbridge unit parked on the carriageway or cycleway verge above. A temporary closure of a carriageway lane or the cycleway verge will be required for this operation. As mentioned in 3.8, inspection can also be carried out via a mobile elevated platform. In this case closure of one of the lanes under the structure would be required.

Access for maintenance of the abutments will be required from ground under the structure.

3.9 Environment and sustainability

An Environmental Statement (ES) will be submitted alongside the planning application for the scheme and its findings will be implemented.

Any protected species in the area will be appropriately protected during construction.

All applicable permanent and temporary consents required will be obtained from the Environment Agency.

3.10 Durability. Materials and finishes

3.10.1 *Materials*

Concrete

Element	Exposure Class
Blinding Concrete	N/A
Abutment	XC3/4, XD1, XF1
Parapet edge beam	XC3/4, XD3, XF4
Deck	XC3/4, XD1, XF1
Pile caps	XC2, XD2
Piles	DC-4 AC-3 See also Table 2

Table 1

Concrete strength, cover etc. to be confirmed in detailed design.

STRUCTURE NAME	ACEC CLASS OF SITE *[derived from BRE SD1]*	STRUCTURAL PERFORMANCE LEVEL	DESIGN CHEMICAL CLASS	OTHER REQUIREMENTS AND DESIGN CONSTRAINTS *[E.g. Limitations on drainage, Additional Protective Measures required etc.]*
Lake Lothing Third Crossing	AC3	100 years*	DC4	

Table 2 – Exposure class for buried concrete

*Note * SD1 provides for 1 in 100 year design*

Reinforcement

Reinforcement shall be Grade B500B ribbed reinforcement in accordance with BS 4449:2005+A2:2009, BS 8666:2005+A1:2008 and BS EN 1992-1:2004.

Characteristic yield strength for reinforcement bars f_{yk} = 500Mpa.

Bond: Minimum relative rib area $f_{R,min}$ in accordance with Table C.2N of BS EN 1992-1:2004.

Any stainless steel reinforcement used in the structure shall conform to BS 6744:2001 Grade 500.

Ultimate tensile strength for steel in pre-stressing strands to be confirmed at detailed AIP stage.

Yield strength for steel in pre-stressing strands to be confirmed at detailed AIP stage.

Waterproofing

The upper surface of the concrete bridge deck shall receive a spray-applied waterproofing system in accordance with SHW clause 2003 and complying with BD47/99. The waterproofing shall be applied to the internal face of the parapet edge beam to 100mm above the adjacent deck surface. The waterproofing shall also be taken down the rear face of the abutments to 200mm below the construction joint at the base of the abutment. All buried concrete surfaces shall be waterproofed with two coats of bituminous resin waterproof paint in accordance with SHW clause 2004.

Superstructure Surface Water

The structure has a longitudinal fall to the south and has transverse falls. A combined kerb and drainage system will be provided along the full length of the bridge on both sides and shall connect into the road drainage system off the bridge. Combined drainage units shall comply with the requirements of the SHW as clarified and/or amended by IAN 117/08.

Superstructure Sub-Surface Water

The kerb deck drainage units will be slotted to collect sub-surface water.

Perforated sub-surface drainage conduits will be provided on the low side(s) of the deck and positively drained to discharge into the road drainage system off the bridge deck.

Substructure

A permeable backing layer in accordance with Cl. 513 shall be provided behind the abutment, with a 150mm diameter perforated drainage pipe installed at the base. It is proposed that the water collected behind the abutments shall be positively drained and connected to highway drainage system with adequate facilities for rodding.

3.10.2 *Finishes*

Exposed formed faces	F4
Buried formed faces	F1
Formed faces to receive bridge deck waterproofing	F3
Bridge deck soffit cantilever	F2
Surfaces to receive bridge deck waterproofing	U4
Abutment exposed faces	F6-3
Exposed unformed surfaces	U3
Buried unformed surfaces	U1
Parapet edge beam	F3

In accordance with CHE Memo 227/08 pore lining impregnation will not be applied.

Lighting strategy will be covered in the separate document.

3.10.3 *Protective coating systems*

Steel Parapets: Hot dip galvanized, with painted finish, maintenance free for up to 15 years, RAL Classic – 6005.

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

The risks and hazards to both the general public and workforce during the construction, operation, maintenance and demolition of the bridge have been considered in a design risk assessment and will be reviewed as design progresses. The key points of note are:

(i) A construction sequence will be stated on the construction drawings, as stated in Section 5.1, to ensure stability of all elements of the structure during all phases of construction.

The Principal Designer is satisfied that the Designers for this structure are currently complying with their duties under Managing Health and Safety in Construction – Construction (Design and Management) Regulations 2015 – Guidance on Regulations (L153).

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

Few options were considered for superstructure and span arrangements as stated below:

1- Steel, this option was discounted, due to high Capital and Whole Life Cost. Steel options would require repainting every 25 years.

2- Semi-integral or simple supported connection between the deck and the abutment was discounted to reduce the maintenance cost.

3- Options with higher distance between beams and longer depth have been discounted to comply with the headroom constrains.

4- An in situ portal type structure comprising reinforced concrete deck integral with reinforced concrete abutments supported on reinforced concrete spread foundations. This option was rejected due to its higher cost and temporary works required during construction.

5- The integration of this span in the south approach viaduct has been discounted due to headroom requirements.

6- The proposed option is an integral structure with a composite deck comprising pre-stressed beams and in situ slab. The deck made fully integral with the abutment as defined on 3.1.

The proposed option was selected because it offers benefits in ease of construction and low maintenance as well as cost in comparison to other options considered.

3.13 Proposed arrangements for construction

3.13.1 *Construction of structure*

There are no unusual construction methods for this structure span. For construction phasing see Section 5.1.

3.13.2 *Traffic management*

The bridge will be constructed on Nexen (Private Land) and the relevant permissions would have to be sought during construction.

3.13.3 *Service diversions*

Liaison with statutory undertakers and corresponding surveys will be undertaken to determine locations of services.

3.13.4 *Interface with existing structures*

There are no interfaces with existing structures to be considered. The south abutment of the approach viaduct structure is at 8m from north abutment of the portal frame. Between the two structures the use of reinforced earth is proposed. Conservatively k* according to PD6694 could be considered in the design of abutment 1 in the south approach viaduct structure.

4 DESIGN CRITERIA

4.1 Actions

4.1.1 *Permanent actions*

All permanent actions are as outlined in BS EN 1991-1-1 and the National Annex;

- The nominal density of 'normal weight' concrete with a normal percentage of reinforcing steel will be taken as 25kN/m³ (26kN/m³ unhardened).
- The pavement material will be designed for a nominal density of 23kN/m³.
- The permanent formwork type and loading will be determined during detailed design.
- The verge infill material will be 'normal weight' concrete, with a nominal density of 24kN/m³ (25kN/m³ unhardened)
- No fill material is being used on the bridge structure in which any significant change in density is anticipated.

All the above values are in accordance with Annex A of BS EN 1991-1-1.

4.1.2 *Snow, Wind and Thermal actions*

All snow, wind and thermal actions are as outlined in BS EN 1991-1-3, 4 and 5 and the appropriate National Annexes.

Snow should be considered in accordance with local conditions. For those conditions prevailing in the United Kingdom, this loading should generally be ignored (refer NA 4.1.1 to BS EN 1991-1-3).

Thermal loading is to be applied in accordance with BS EN 1991-1-5 and the National Annex. Approach 2 will be used for the vertical temperature difference in the bridge.

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

Load models LM1 and LM2 shall be as outlined in BS EN 1991-2 and the appropriate National Annex.

4.1.4 *Actions relating to General Order traffic under STGO regulations*

Load model LM3 designed for SV80, SV100, SV196 with accompanying Load Model 1. This requirement will be included within the structure maintenance manual.

4.1.5 *Footway or footbridge variable actions*

The verges shall have footway live loading applied as outlined in BS EN 1991-2 and the appropriate National Annex.

Accidental wheel loads shall be considered in the design of raised verges as outlined in BS EN 1991-2.

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

None.

4.1.7 *Accidental actions*

The design will take into account accidental actions, including impact on the supporting substructure and superstructure, as outlined in NA BS EN 1991-1-7 Table NA.1 and the appropriate National Annex and IAN 124.

4.1.8 *Action during construction*

The design will take into account any adverse actions during execution as outlined in BS EN 1991-1-6 and the appropriate National Annex.

The criteria associated with serviceability limit states during execution will be the same as those applicable to the completed structure.

4.1.9 *Any special action not covered above*

The design will take into account actions related to inspection works such as the load imposed by an underbridge unit supporting over the deck, according to BS EN 1991-2:2003.

The design will also take into account the future provision of an additional traffic lane by reducing the width of verges to 2.5m.

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

None.

4.3 Minimum headroom provided

Paved width headroom shall not be less than 5.3 metres

4.4 Authorities consulted and any special conditions required

Authority	Plant/Apparatus	Special Conditions
None		

Table 3

4.5 Standards and documents listed in the Technical Approval Schedule

See attached schedule in Appendix A.

4.6 Proposed Departures relating to departures from standards given in 4.5

None.

4.7 Proposed Departures relating to methods for dealing with aspects not covered by standards in 4.5

None proposed.

5 STRUCTURAL ANALYSIS

5.1 Methods of analysis proposed for superstructure, substructure and foundations

The design of all the structural elements will take full account of the effects resulting from the construction sequence.

The anticipated construction sequence is:

a) Construct foundations.

b) Construct abutments.

c) Install geotechnical monitoring Instrumentation.

d) Construct embankments in accordance with the requirements of the Construction Sequence as set out in the 600 Series Specification.

e) Place the precast pre-stressed beams over the abutments

f) Cast the deck and diaphragm to create the integral connection between the deck and the abutment.

g) Construct parapets.

h) Install bridge verges and carriageway surfacing.

i) Install bridge furniture

Superstructure and substructure

To be confirmed in detail design

Foundations

To be confirmed in detail design.

5.2 Assumptions intended for calculation of structural element stiffness

Member properties will be based on the gross section.

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

To be confirmed in detail design.

6 GEOTECHNICAL CONDITIONS

6.1 Acceptance of recommendations of the Geotechnical Design Report to be used in the design and reasons for any proposed changes

To be confirmed after geotechnical investigation.

6.2 Differential settlement to be allowed for in the design of the structure

To be confirmed after geotechnical investigation.

7 CHECK

7.1 Proposed Category and Design Supervision Level

Category II

Design Supervision Level – DSL2

7.2 If Category 3, name of proposed Independent Checker

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

The Contractor will be responsible for the temporary works design including the stability of structures in the temporary construction situations. This will include, but is not limited to:

- Installation of temporary piling platforms and ramps.
- Installation of temporary supports to the abutments.
- Temporary works associated with construction of deck.

8 DRAWINGS AND DOCUMENTS

8.1 List of Drawings (Including Numbers) and Documents Accompanying the Submission

See Appendices below

APPENDIX A – Technical Approval Schedule "TAS"

APPENDIX B – General arrangement drawings.

APPENDIX C – Designer Risk Assessment.

APPENDIX D – Technical Note for Costing

9 THE ABOVE IS SUBMITTED FOR ACCEPTANCE

Signed	
Name	Mark Northing
Position Held	Design Team Leader
Engineering Qualifications	MEng, CEng, MICE
Name of Organisation	WSP
Date	2/3/18

10 THE ABOVE IS REJECTED/AGREED SUBJECT TO THE AMENDMENTS AND CONDITIONS SHOWN BELOW

1. Requirements relating to access to be maintained during construction need to be clarified.
2. Whole life costing needs more detailed consideration with respect to ongoing inspection and maintenance costs.

Signed	
Name	COLIN GODFREY
Position held:	STRUCTURES MANAGER
Engineering Qualifications	BSc CEng MICE
TAA	SUFFOLK COUNTY COUNCIL
Date	2/3/18

APPENDIX A – Technical Approval Schedule "TAS"

Technical Approval Schedule "TAS"

Schedule of Documents Relating to Design of Highway Bridges and Structures using Structural Eurocodes

British Standards

Non-conflicting with Eurocodes.

Used	Document & Publication Date	Title
✓	BS 4449:2005 +A2:2009	Steel for the reinforcement of concrete etc.
	BS 4483:2005	Steel fabric for the reinforcement of concrete.
	BS 5896:2012	High tensile steel wire and strand for the prestressing of concrete. Specification
	BS 5930:2015	Code of practice for ground investigations
	BS 6031:2009	Code of practice for earthworks
	BS 6744:2001+A2:2009	Stainless steel bars for the reinforcement of and use in concrete. Requirements and test methods
	BS 6779-4:1999	Highway parapets for bridges and other structures. . Specification for parapets of reinforced and unreinforced masonry construction
	BS 7818:1995	Specification for pedestrian restraint systems in metal
	BS 8006-1:2010	Code of practice for strengthened/reinforced soils and other fills
✓	BS 8500-1:2015	Concrete - Complimentary British standard to BS EN 206-1. Method of specifying and guidance for the specifier
✓	BS 8500-2:2015	Concrete – Complementary British Standard to BS EN 206. Specification for constituent materials and concrete.
✓	BS 8666:2005+A1:2008	Scheduling, dimensioning, bending and cutting of steel reinforcement for concrete - Specification
	BS EN 14388: 2002	Road traffic noise reducing devices - Specification

Eurocodes and associated UK National Annexes

All national annexes will be used with the list of documents below. . Users to confirm latest Amendments and Corrigenda.

Used	Eurocode Part	Title	Publication Date	UK National Annex Publication Date
	Eurocode 0	**Basis of Structural Design**		
✓	BS EN 1990 +A1:2005	Eurocode 0: Basis of structural design	27-Jul-02	15-Dec-04
	Eurocode 1	**Actions on Structures**		
✓	BS EN 1991-1-1	Actions on structures – Part 1-1: General actions – Densities, self-weight and imposed loads	29-Jul-02	30-Dec-05
✓	BS EN 1991-1-3	Actions on structures – Part 1-3: General actions – Snow loads	24-Jul-03	23-Dec-05
✓	BS EN 1991-1-4 +A1:2010	Actions on structures – Part 1-4: General actions – Wind actions	25-Apr-05	30-Sep-08
✓	BS EN 1991-1-5	Actions on structures – Part 1-5: General actions – Thermal actions	04-Mar-04	30-Apr-07
✓	BS EN 1991-1-6	Actions on structures – Part 1-6: General actions – Actions during execution	15-Dec-05	30-May-08
✓	BS EN 1991-1-7	Actions on structures – Part 1-7: General actions – Accidental actions	29-Sep-06	31-Dec 08
✓	BS EN 1991-2	Actions on structures – Part 2: Traffic loads on bridges	31-Oct-03	30-May-08
	Eurocode 2	**Design of Concrete Structures**		
✓	BS EN 1992-1-1 +A1:2014	Design of concrete structures – Part 1-1: General – Common rules for building and civil engineering structures	23-Dec-04	08-Dec-05
✓	BS EN 1992-2	Design of concrete structures – Part 2: Bridges	02-Dec-05	31-Dec-07
	Eurocode 3	**Design of Steel Structures**		
	BS EN 1993-1-1	Design of steel structures – Part 1-1: General rules and rules for buildings	18-May-05	31-Dec-08
	BS EN 1993-1-3	Design of steel structures. General rules. Supplementary rules for cold-formed members and sheeting	30-Nov-06	28-Feb-09
	BS EN 1993-1-4	Design of steel structures – Part 1-4: General Supplementary rules for stainless steel	30-Nov-06	28-Feb-09

Used	Eurocode Part	Title	Publication Date	UK National Annex Publication Date
	BS EN 1993-1-5	Design of steel structures – Part 1-5: General – Strength and stability of planar plated structures without transverse loading	30-Nov-06	30-May-08
	BS EN 1993-1-6	Design of steel structures – Part 1-6 Strength and stability of shell structures	31-May-07	-
	BS EN 1993-1-7	Design of steel structures – Part 1-7: General – Design values for plated structures subjected to out of plane loading	31-Jul-07	Not yet published
	BS EN 1993-1-8	Design of steel structures – Part 1-8: General – Design of joints	17-May-05	31-Dec-08
	BS EN 1993-1-9	Design of steel structures – Part 1-9: General – Fatigue strength	18-May-05	30-May-08
	BS EN 1993-1-10	Design of steel structures – Part 1-10: General – Material toughness and through thickness assessment	18-May-05	31-Dec-08
	BS EN 1993-1-11	Design of steel structures – Part 1-11: General – Design of structures with tension components	30-Nov-06	31-Dec-08
	BS EN 1993-1-12	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	31-May-07	30-May-08
	BS EN 1993-2	Design of steel structures – Part 2-1: Bridges	30-Nov-06	30-May-08
	BS EN 1993-5	Design of steel structures – Part 5: Piling	30-Apr-07	31-Mar-09
	Eurocode 4	**Design of Composite and Concrete Structures**		
	BS EN 1994-1-1	Design of composite steel and concrete structures – Part 1-1: General – Common rules and rules for buildings	18-Feb-05	29-Aug-08
	BS EN 1994-2	Design of composite steel and concrete structures – Part 2: Bridges	02-Dec-05	31-Dec-07
	Eurocode 5	**Design of Timber Structures**		
	BS EN 1995-1-1 +A2:2014	Design of timber structures – Part 1-1: General – Common rules and rules for buildings	15-Dec-04	31-Oct-06
	BS EN 1995-1-2	Design of timber structures – Part 1-2: General – Structural fire design	15-Dec-04	31-Oct-06
	BS EN 1995-2	Design of timber structures – Part 2: Bridges	15-Dec-04	31-Oct-06

Used	Eurocode Part	Title	Publication Date	UK National Annex Publication Date
	Eurocode 6	**Design of Masonry Structures**		
	BS EN 1996-1-1	Design of masonry structures – Part 1-1: General – Rules for reinforced and unreinforced masonry, including lateral loading	30-Dec-05	31-May-07
	BS EN 1996-1-2	Design of masonry structures – Part 1-2: General – Structural fire design	30-Jun-05	31-May-07
	BS EN 1996-2	Design of masonry structures – Part 2: Selection and execution of masonry	15-Feb-06	31-May-07
	BS EN 1996-3	Design of masonry structures – Part 3: Simplified calculation methods for masonry structures	15-Feb-06	31-May-07
	Eurocode 7	**Geotechnical design**		
✓	BS EN 1997-1 +A1:2013	Geotechnical design – Part 1: General rules	22-Dec-04	30-Nov-07
✓	BS EN 1997-2	Geotechnical design – Part 2: Ground investigation and testing	30-Apr-07	31 Mar 09
	Eurocode 8	**Design of Structures For Earthquake Resistance**		
	BS EN 1998-1 +A1:2013	Design of structures for earthquake resistance – Part 1: General rules seismic actions and rules for buildings	08-Apr-05	29-Aug-08
	BS EN 1998-2 +A2:2011	Design of structures for earthquake resistance – Part 2: Bridges	20-Dec-05	30-June-09
	BS EN 1998-5	Design of structures for earthquake resistance – Part 5: Foundations, retaining structures and geotechnical aspects	08-Apr-05	29-Aug-08
	Eurocode 9	**Design of Aluminium Structures**		
	BS EN 1999-1-1 +A2:2013	Design of aluminium structures – Part 1-1: General – Common rules	31-Aug-07	31-Dec-08
	BS EN 1999-1-2	Design of aluminium structures – Part 1-2: General – Structural fire design	30-Apr-07	31-Mar-09
	BS EN 1999-1-3 +A1:2011	Design of aluminium structures – Part 1-3: Additional rules for structures susceptible to fatigue	31-Aug-07	31-Dec-08
	BS EN 1999-1-4	Design of aluminium structures – Part 1-4: Supplementary rules for trapezoidal sheeting	30-Apr-07	31-Mar-09
	BS EN 1999-1-5	Design of aluminium structures – Part 1-5: Supplementary rules for shell structures	30-Apr-07	31-Mar-09

BSI Published Documents

Used	Document Reference	Title	Date of Issue
✓	PD 6688-1-1	Background paper to the UK National Annex to BS EN 1991-1-1 [Actions on structures – General Actions – Densities, self-weight and imposed loads]	May 2011
	PD 6688-1-4	Background paper to the UK National Annex to BS EN 1991-1-4 [Actions on structures – General Actions – Wind actions]	2015
✓	PD 6688-1-7 +A1:2014	Recommendations for the design of structures to BS EN 1991-1-7 [Actions on structures – General Actions – Accidental actions]	2009
✓	PD 6688-2	Recommendations for the design of structures to BS EN 1991-2 [Actions on structures – General Actions – Traffic loads on bridges]	Mar 2011
✓	PD 6687-1	Background paper to the UK National Annex to BS EN 1992-1 & 3 [Design of concrete structures]	Dec 2010
✓	PD 6687-2	Recommendations for the design of structures to BS EN 1992-2 [Design of concrete structures - Bridges]	2008
✓	PD 6694-1	Recommendations for the design of structures subject to traffic loading to BS EN 1997-1 [Geotechnical Design – General rules]	May 2011
✓	PD 6695-1-9	Recommendations for the design of structures to BS EN 1993-1-9 [Design of steel structures – General – Fatigue Strength]	2008
✓	PD 6695-1-10	Recommendations for the design of structures to BS EN 1993-1-10 [Design of steel structures – General – Material toughness and through thickness assessment]	2009
✓	PD 6695-2 + A1:2012 Incorporating Corrigendum No.1	Recommendations for the design of bridges to BS EN 1993 [Design of steel structures]	2008
✓	PD 6696-2 +A1:2012	Background paper to BS EN 1994-2 and the UK National Annex to BS EN 1994-2 [Design of composite steel and concrete structures – Bridges]	2007
	PD 6698	Recommendations for the design of structures for earthquake resistance to BS EN 1998 [Design of structures for earthquake resistance]	2009
✓	PD 6703	Structural bearings – Guidance on the use of structural bearings	2009
✓	PD 6705-2 +A1:2013	Recommendations for the execution of steel bridges to BS EN 1090-2	Dec 2010

Execution Standards

Used	Document Ref	Title	Date
	BS EN 1090-1 +A1:2011	Execution of steel structures and aluminium structures. Requirements for conformity assessment of structural components	2009
	BS EN 1090-2 +A1:2011	Execution of steel structures and aluminium structures. Technical requirements for steel structures	2008
	BS EN 1090-3	Execution of steel structures and aluminium structures. Technical requirements for aluminium structures	2008
	BS EN 13670	Execution of concrete structures	2009

Product Standards

Used	Document Ref	Title	Date
✓	BS EN 1337	Structural Bearings, Parts 1 - 11.	Various
✓	BS EN 10080	Steel for the reinforcement of concrete. Weldable reinforcing steel	2005
✓	BS EN 10025	Hot rolled products of structural steels, Pt 1 to 6, example see below:	2004
✓	BS EN 10025-5	Hot rolled products of structural steels. . Technical delivery conditions for structural steels with improved atmospheric corrosion resistance (weathering steels)	2004
✓	BS EN 206-1 Corrigenda Nos. 1 and 2 and Amendments Nos. 1, 2 and 3.	Concrete. Specification, performance, production and conformity	2013
✓	BS 5896	High tensile steel wire and strand for the prestressing of concrete - Specification.	2012
	prEN 10138-3	DPC Prestressing steels Part 3: Strand - under development use BS 5896.	
✓	BS EN 1317-1-2010	Road Restraints Systems – Part 1, Terminology and general criteria for test methods	2010
✓	BS EN 1317-2-2010	Road Restraints Systems – Part 2, Performance classes, impact test acceptance criteria and test methods for safety barriers	2010
	BS EN 1317-3-2010	Road Restraints Systems – Part 3, Performance classes, impact test acceptance criteria and test methods for crash cushions	2010
✓	DD ENV 1317-4-2002	Road Restraints Systems – Part 4, Performance classes, impact test acceptance criteria and test methods for terminals and transitions of safety barriers	2002
	BS EN 13369	Common rules for precast concrete products	2013
	BS EN 15050	Bridge elements	2007
	BS EN 14844 +A2:2011	Box culverts	2006
✓	BS EN 15258	Retaining wall elements	2008
	BS EN 12843	Masts and poles	2004
✓	BS EN 12794	Foundation piles	2005

The Manual of Contract Documents for Highway Works (MCDHW)

Used	Title	Date of Issue
✓	Volume 1: Specification for Highway Works	Feb 2016
✓	Volume 2: Notes for Guidance on the Specification for Highway Works	Feb 2016
✓	Volume 3: Highway Construction Details	Nov 2005

The Design Manual for Roads and Bridges (DMRB)

The following have been reproduced from the current alpha-numeric index in the DMRB, Volume 0, Section 1, Part 1, dated Sept 2015.

This must be read in conjunction with DEM 134/11, Annex C. . Annex C includes guidance in lieu of BA 36, BA 42, BA 57, BA 59, BA 84, BD 20, BD 57 and BD 70. .

Reference to be made to superscript notes for conditions of use where applicable. .

Used	Document Reference	Title	Date of Issue	Decimal Ref.
Design Manual for Roads and Bridges (DMRB)				
✓	GD 01/15	Introduction to the Design Manual for Roads and Bridges	Aug 2015	0.1.2
✓	GD 02/08	Quality Management Systems for Highway Design	May 2008	0.2.1
	GD 04/12	Standard for Safety Risk Assessment on The Strategic Road Network	Nov 2012	0.2.3
	GD 5/16	Asbestos Management in Trunk Road Assets.		0.2.4
Bridges and Structures, Advice Notes (BA Series)				
	BA 09/81	The Use of BS 5400: Part 10: 1980 Code of Practice for Fatigue Amendment No.1	Dec 1981 Nov 1983	1.3
	BA 16/97	The Assessment of Highway Bridges and Structures. Amendment No. 1 Amendment No. 2	May 1997 Nov 1997 Nov 2001	3.4.4
	BA 19/85	The Use of BS 5400; Part 3; 1982	Jan 1985	1.3
	BA 26/94	Expansion Joints for Use in Highway Bridge Decks	Nov 1994	2.3.7
	BA 28/92	Evaluation of Maintenance Costs in Comparing Alternative Designs for Highway Structures	Aug 1992	1.2.2
	BA 30/94	Strengthening of Concrete Highway Structures Using Externally Bonded Plates	Feb 1994	3.3.1
	BA 35/90	Inspection and Repair of Concrete Highway Structures	Jun 1990	3b
	BA 36/90	The Use of Permanent Formwork	Feb 1991	2.3.7
	BA 37/92	Priority Ranking of Existing Parapets	Oct 1992	2.3.2
	BA 38/93	Assessment of the Fatigue Life of Corroded or Damaged Reinforcing Bars	Oct 1990	3.4.5
	BA 39/93	Assessment of Reinforced Concrete Half-joints	Apr 1993	3.4.6
	BA 40/93	Tack Welding of Reinforcing Bars	Apr 1993	1.3.4

Used	Document Reference	Title	Date of Issue	Decimal Ref.
✓	BA 41/98	The Design and Appearance of Bridges	Feb 1998	1.3.11
	BA 42/96	The Design of Integral Bridges [Incorporating Amendment No.1 dated May 2003]	Nov 1996	1.3.12
	BA 44/96	Assessment of Concrete Highway Bridge and Structures	Nov 1996	3.4.15
✓	BA 47/99 [1]	Waterproofing and Surfacing of Concrete Bridge Decks	Aug 1999	2.3.5
	BA 51/95	The Assessment of Concrete Structures Affected by Steel Corrosion	Feb 1995	3.4.13
	BA 52/94	The Assessment of Concrete Highway Structures Affected by Alkali Silica Reaction	Nov 1994	3.4.10
	BA 53/94	Bracing Systems and The Use of U-Frames in Steel Highway Bridges	Dec 1994	1.3.13
	BA 54/94	Load Testing for Bridge Assessment	Apr 1994	3.4.8
	BA 55/06	The Assessment of Bridge Substructures and Foundations, Retaining Walls and Buried Structures	May 2006	3.4.9
	BA 57/01	Design for Durability	Aug 2001	1.3.8
	BA 58/94	Design of Bridges and Concrete Structures with External Unbonded Prestressing	Nov 1994	1.3.10
	BA 59/94	Design of Bridges for Hydraulic Action	May 1994	1.3.6
	BA 67/96	Enclosure of Bridges	Aug 1996	2.2.8
	BA 72/03	Maintenance of Road Tunnels	May 2003	3.2.3
	BA 82/00	Formation of Continuity Joints in Bridge Decks	Nov 2000	2.3.7
	BA 83/02	Cathodic Protection for Use in Reinforced Concrete Highway Structures	Feb 2002	3.3.3
	BA 85/04	Coatings For Concrete Highway Structures & Ancillary Structures	May 2004	2.4.3
	BA 86/06	Advice Notes on the Non-Destructive Testing of Highway Structures	Aug 2006	3.1.7
	BA 87/04	Management of Corrugated Steel Buried Structures Correction No.1 Correction No.2	Aug 2004 Feb 2006 Nov 2009	3.3.4
	BA 88/04	Management of Buried Concrete Box Structures	Aug 2004	3.3.5
✓	BA 92/07	The Use of Recycled Concrete Aggregates in Structural Concrete	May 2007	2.3.9
	BA 93/09	Structural Assessment of Bridges with Deck Hinges	Feb 2009	3.1.5
Bridges and Structures, Standards (BD Series)				
✓	BD 02/12	Technical Approval of Highway Structures	May 2012	1.1.1
	BD 07/01	Weathering Steel for Highway Structures	Nov 2001	2.3.8
	BD 09/81	Implementation of BS 5400: Part 10: 1980. Code of Practice for Fatigue	Dec 1981	1.3
	BD 10/97	Design of Highway Structures in Areas of Mining Subsidence	May 1997	1.3.14
	BD 12/01	Design of Corrugated Steel Buried Structures with Spans Greater than 0.9 Metres and up to 8.0 Metres	Nov 2001	2.2.6
	BD 13/06	Design of Steel Bridges. Use of BS 5400 -3: 2000	May 2006	1.3.14

Used	Document Reference	Title	Date of Issue	Decimal Ref.
	BD 15/92	General Principles for The Design and Construction of Bridges: Use of BS 5400: Part 1: 1988	Dec 1992	1.3.2
	BD 16/82	Design of Composite Bridges. Use of BS 5400: Part 5: 1979 Amendment No.1	Nov 1982 Dec 1987	1.3
	BD 20/92	Bridge Bearings. Use of BS 5400: Part 9: 1983	Oct 1992	2.3.1
	BD 21/01	The Assessment of Highway Bridges and Structures	May 2001	3.4.3
	BD 24/92	Design of Concrete Bridges. Use of BS 5400 part 4: 1990	Nov 1992	1.3.1
	BD 27/86	Materials for the Repair of Concrete Highway Structures	Nov 1986	3.3
	BD 29/17	Design Criteria for Footbridges	May 2017	2.2.8
	BD 30/87	Backfilled Retaining Walls and Bridge Abutments	Aug 1987	2.1
	BD 31/01	The Design of Buried Concrete Box and Portal Frame Structures	Nov 2001	2.2.12
✓	BD 33/94	Expansion Joints for Use in Highway Bridge Decks	Nov 1994	2.3.6
✓	BD 35/14	Quality Assurance Schemes for Paints and Similar Protective Coatings	Aug 2014	2.4.1
	BD 36/92	Evaluation of Maintenance Costs in Comparing Alternative Designs for Highway Structures	Aug 1992	1.2.1
	BD 37/01	Loads for Highway Bridges	Aug 2001	1.3.14
	BD 43/03	The Impregnation of reinforced and Prestressed Concrete Highway Structures using Hydrophobic Pore-Lining Impregnants *Note HA moratorium, ref TAA*	Feb 2003	2.4.2
	BD 44/15	The Assessment of Concrete Highway Bridges and Structures	Aug 2015	3.4.14
	BD 45/93	Identification Marking of Highway Structures	Aug 1993	3.1.1
✓	BD 47/99	Waterproofing and Surfacing for Concrete Bridge Decks	Aug 1999	2.3.4
	BD 48/93	The Assessment and Strengthening of Highway Bridge Supports	Jun 1993	3.4.7
	BD 49/01	Design Rules for Aerodynamic Effects on Bridges	May 2001	1.3.3
	BD 51/14	Portal and Cantilever Signs/Signal Gantries	May 2014	2.2.4
	BD 53/95	Inspection and Records for Road Tunnels	Jul 1995	3.1.6
✓	BD 54/15	Management of Post-tensioned Concrete Bridges	Feb 2015	3.2.5
	BD 56/10	The Assessment of Steel Highway Bridges and Structures	Jun 2010	3.4.11
	BD 57/01	Design for Durability	Aug 2001	1.3.7
✓	BD 58/94	The design of Concrete Highway Bridges and Structures with External and Unbonded Prestressing	Nov 1994	1.3.9
	BD 60/04	Design of Highway Bridges for Vehicle Collision Loads	May 2004	1.3.5
	BD 61/10	The Assessment of Composite Highway Bridges and Structures	Jun 2010	3.4.16
✓	BD 62/07	As Built, Operational and Maintenance Records for Highway Structures	Feb 2007	3.2.1
	BD 63/07	Inspection of Highway Structures	Feb 2007	3.1.4
	BD 65/14	Design Criteria for Collision Protector Beams	Dec 2014	2.2.5

Used	Document Reference	Title	Date of Issue	Decimal Ref.
	BD 67/96	Enclosures of Bridges	Aug 1996	2.2.7
	BD 70/03	Strengthened/Reinforced Soils and Other Fills for Retaining Walls and Bridge Abutments Use of BS 8006; 1995, incorporating Amendment No.1 (Issue 2 March 1999)	May 2003	2.1.5
	BD 78/99	Design of Road Tunnels	Aug 1999	2.2.9
	BD 79/13	The Management of Sub-standard Highway Structures	Feb 2013	3.4.18
	BD 81/02	Use of Compressive Membrane Action in Bridge Decks	May 2002	3.4.20
	BD 82/00	Design of Buried Rigid Pipes	Aug 2000	2.2.10
	BD 84/02	Strengthening of Concrete Bridge Supports Vehicle Impact Using Fibre Reinforced Polymers	Aug 2002	1.3.16
	BD 85/08	Strengthening Highway Structures Using Externally Bonded Fibre Reinforced Polymer	Nov 2008	1.3.18
	BD 86/11	The Assessment of Highway Bridges and Structures For The Effects of Special Types General Order (STGO) and Special Order (SO) Vehicles	Nov 2011	3.4.19
	BD 87/05	Maintenance Painting of Steelwork	May 2005	3.2.2
	BD 89/03	The Conservation of Highway Structures	Nov 2003	3.2.4
	BD 90/05	Design of FRP Bridges and Highway Structures	May 2005	1.3.17
	BD 91/04	Unreinforced Masonry Arch Bridges	Nov 2004	2.2.14
	BD 94/07	Design of Minor Structures	Feb 2007	2.2.1
	BD 95/07	Treatment of Existing Structures on Highway Widening Schemes	Aug 2007	1.2.3
	BD 97/12	Assessment of Scour and Other Hydraulic Actions at Highways Bridges	May 2012	3.4.21
	BD 101/11	Structural Review and Assessment of Highway Structures	Nov 2011	3.4.22
Bridges and Structures, Technical memoranda (BE Series)				
	BE 13	Fatigue Risk in Bailey Bridges	Apr 1968	3.4
	BE 23	Shear Key Decks Amendment No.1 to Annex	Nov 1970 Jun 1971	1.3
	BE 05/75	Rules for The Design and Use of Freyssinet Concrete Hinges in Highway Structures	Mar 1975	1.3
	BE 07/04	Departmental Standard (Interim) Motorway Sign/Signal Gantries	Aug 2004	2.2
Traffic Engineering and Control, Standards (TD and TA Series)				
	TA 11/09	Traffic Surveys by Roadside Interview	Nov 2009	5.1.4
	TA 12/07	Traffic Signals on High Speed roads	May 2007	8.1.1
	TA 15/07	Pedestrian Facilities at Traffic Signal Installations	May 2007	8.1.1
	TA 16/07	General Principles of Control by Traffic Signals	May 2007	8.1.1
	TA 22/81	Vehicle Speed Measurement on All-Purpose Roads	Nov 1981	5.1

Used	Document Reference	Title	Date of Issue	Decimal Ref.
	TA 23/81	Junctions and Accesses Determination of Size of Roundabouts and Major/Minor Junctions	Dec 1981	6.2
	TA 30/82	Choice Between Options for Use in The Assessment of New Rural Roads	Jul 1982	5.1
	TA 46/97	Traffic Flows Ranges for Use in The Assessment of New Rural Roads	Feb 1997	5.1.3
	TA 49/07	Appraisal of New and replacement Lighting on The Strategic Motorway and All Purpose Trunk Road Network	Aug 2007	8.3
	TA 56/87	Hazardous cattle Crossings: Use of Flashing Amber Lamps	Nov 1987	8.2
	TA 57/87	Roadside Features [Chapters 2 and 3 are superseded by TD 69/07]	Jan 1989	6.3
	TA 60/90	The Use of variable Message Signs on All-Purpose and Motorway Trunk Roads	Aug 1990	8.2
	TA 64/94	Narrow Lanes and Tidal Flow Operations at Roadworks on Motorways and Dual carriageway Trunk Roads with Full Width Hard Shoulders	Apr 1994	8.4.3
	TA 66/95	Police Observation Platforms on Motorways	Jan 1995	6.3.2
	TA 68/96	The Assessment and Design of Pedestrian Crossings	Nov 1996	8.5.1
	*TA 70/97	Motorways. Introduction	Feb 1997	9.2.1
	*TA 71/97	Motorways. Overview	Feb 1997	9.3.1
	*TA 72/97	National Motorways Communications Systems (NMCS)	Feb 1997	9.4.1
	*TA 73/16	Emergency roadside telephone	Aug 2016	9.2.1
	*TA 74/05	Motorway Signalling	Nov 2005	9.4.3
	*TA 76/97	Motorway Control Offices	Feb 1997	9.4.5
	TA 78/97	Design of Road Markings at Roundabouts	Nov 1997	6.2.3
	TA 79/99	Traffic Capacity of Urban Roads Amendment No. 1	Feb 1999 May 1999	5.1.3
	TA 80/99	Surface Drainage of Wide Carriageways	Feb 1999	4.2.2
	TA 81/99	Coloured Surfacing in Road Layout (Excluding Traffic Calming)	Feb 1999	6.3.4
	TA 82/99	The Installation of Traffic Signals and Associated Equipment	May 1999	8.1.1
	TA 83/05	Guide to The Use of Variable Message Signs for Strategic Traffic Management on Trunk Roads and Trunk Road Motorways	Nov 2005	9.4.6
	TA 84/06	Code of Practice for Traffic Control and Information for Systems for All-Purpose Roads [Incorporates Correction dated Feb 2007]	May 2006	8.1.2
	TA 85/01	Guidance of Minor Improvements to Existing Roads	Nov 2001	6.1.3
	TA 86/03	Layout of Large Signal Controlled Junctions	Feb 2003	6.2.8
	TA 87/04	Trunk Road Traffic Calming	Feb 2004	6.3.5

Used	Document Reference	Title	Date of Issue	Decimal Ref.
	TA 90/05	The Geometric Design of Pedestrian, Cycle and Equestrian Routes	Feb 2005	6.3.5
	TA 91/05	Provision for Non-Motorised Users	Feb 2005	5.2.4
	TA 92/03	Crossover and Changeover Design	Nov 2003	8.4.6
	TA 98/08	The Layout of Toll Plazas	Feb 2008	6.3.6
	TD 07/07	Statutory Approval of Traffic Control Equipment	May 2007	8.1.1
✓	TD 09/93	Road Geometry and Highway link design Amendment No.1	Jun 1993 Feb 2002	6.1.1
	TD 11/82	Use of Certain Departmental Standards in The Design and Assessment of Trunk Road Schemes	Jul 1982	5.1
	TD 16/07	Geometric Design of Roundabouts	Aug 2007	6.2.3
	TD 17/85	Criteria for The Provision of Closed Circuit Television on Motorways	May 1985	9.3
	TD 18/85	Criteria for The Use of Gantries for Traffic Signs and Matrix Traffic Signals on Trunk Roads and Trunk Road Motorways	Jul 1985	9.1
✓	TD 19/06[1]	Requirement for Road Restraint Systems Correction No. 1	Aug 2006 Feb 2008	2.2.8
	TD 22/06	Layout of Grade Separated Junctions	Feb 2006	6.2.1
	TD 23/99	Trunk Roads and Trunk Road Motorways Inspection and Maintenance of Road Lighting	Nov 1999	8.3
	TD 24/97	All-Purpose Trunk Roads Inspection and Maintenance of Traffic Signals and Associated Equipment	Aug 1997	8.1
	TD 25/01	Inspection and Maintenance of Traffic Signs on Motorway and All-Purpose Truck Roads	Feb 2001	8.2.2
	TD 26/07[1]	Inspection and Maintenance of Road Markings and Road Studs on Motorway and All-Purpose Truck Roads	May 2007	8.2.2
✓	TD 27/05	Cross sections and Headroom	Feb 2005	6.1.2
	TD 33/05	The Use of Variable Message Signs on All-Purpose and Motorway Trunk Roads	Nov 2005	8.2.2
	TD 34/07	Design of Road Lighting for The Strategic Motorway and All Purpose Trunk Road Network	Aug 2007	8.3
	TD 35/06	All Purpose Trunk Roads MOVA System of Traffic Control at Signals	May 2006	8.1.1
	TD 36/93	Subways for Pedestrians and Pedal Cyclists, Layout and Dimensions	Jul 1993	6.3.1
	TD 37/93	Scheme Assessment Reporting	Aug 1993	5.1.2
	TD 39/94	The Design of Major Interchanges	Apr 1994	6.2.4
	TD 40/94	The Layout of Compact Grade Separated Junctions	Jul 1994	6.2.5
	TD 41/95	Vehicular Access to All Purpose Trunk Roads	Mar 1995	6.2.7
	TD 42/95	Geometric Design of Major/Minor Priority Junctions	Jan 1995	6.2.6
	TD 45/94	Motorway Incident Detection and Automatic Signalling (MIDAS)	Dec 1994	9.1.2

Used	Document Reference	Title	Date of Issue	Decimal Ref.
	TD 46/05	Motorway Signalling	Nov 2005	9.1.1
	TD 49/07	Requirements for Lorry Mounted Crash Cushions	Nov 2007	8.4.7
	TD 50/04	The Geometric Layout of Signal-Controlled Junctions and Signalised Roundabouts	Nov 2004	6.2.3
	TD 51/03	Segregated Left Turn Lanes and Subsidiary Deflection islands at Roundabouts	Nov 2003	6.3.5
	TD 52/04	Traffic Signs to Tourist Attractions and facilities in England: Tourist Signing – Trunk Roads	Feb 2004	8.2.4
	TD 53/05	Traffic Signs to Retail Destinations and Exhibition Centres in England and Wales – Trunk Roads	Feb 2005	8.2.6
	TD 54/07	Design of Mini Roundabouts	Aug 2007	6.2.2
	TD 69/07	The Location and layout of Lay-Bys and Rest Areas	Nov 2007	6.3.3
	TD 70/08	Design of Wide Single 2+1 Roads	Aug 2008	6.1.4
	TD 72/17	Transmission Infrastructure	Feb 2017	9.3.1
	TD 89/08	Use of Passively Safe Signposts, Lighting Columns & Traffic Signal Posts to BS EN 12767	May 2008	8.2.2

Notes: Refer to Annex C of IAN 124 for additional guidance/ requirements. Check current position with IAN 97/07 Assessment and Upgrading of Existing Parapets and TD 19/06 Requirement for Road Restraint Systems.

Advice Notes – Highways (HA Series)				
	HA 13/81	The Planting of Trees and Shrubs	Feb 1981	5.2
	HA 37/97	Hydraulic Design of Road Edge Surface Water Channels	Aug 1997	4.2
	HA 39/98	Edge of Pavement Details	Aug 1998	4.2.1
	HA 40/01	Determination of Pipe and Bedding Combinations for Drainage Works	Nov 2001	4.2.5
	HA 41/90	A Permeameter for Drainage Layers	Apr 1990	4.2
	HA 44/91	Design and Preparation of Contract Documents Amendment No. 1	Jun 1991 Apr 1995	4.1.1
	HA 55/92	New Roads Landform and Alignment	Dec 1992	10.1.1
	HA 56/92	New Roads Planting, Vegetation and Soils	Dec 1992	10.1.2
	HA 57/92	New Roads Integration with Rural Landscapes	Dec 1992	10.1.3
	HA 58/92	New Roads The Road Corridor Amendment No. 1	Dec 1992 Feb 1997	10.1.4
	HA 59/92	Mitigating Against Effects on Badgers	Feb 1997	10.4.2
	HA 60/92	New Roads Heritage	Dec 1992	10.1.5
	HA 63/92	Improving Existing Roads Improvement Techniques	Dec 1992	10.2.2
	HA 65/94	Design Guide for Environmental Barriers	Jul 1994	10.5.1
	HA 66/95	Environmental Barriers – Technical Requirements	Sep 1995	10.5.2
	HA 67/93	The Wildflower Handbook	Jun 1993	10.3.1

	HA 70/94	Construction of Highway Earthworks	Dec 1994	4.1.5
	HA 74/07	Treatment of Fill and Capping Materials using Either Lime or Cement or Both	May 2007	4.1.6
	HA 75/01	Trunk Roads and Archaeological Mitigation	Feb 2001	10.6.1
	HA 78/96	Design of Outfalls for Surface Water Channels	Jan 1996	4.2.2
	HA 79/97	Edge of Pavement Details for Porous Asphalt Surface Cones	Feb 1997	4.2.4
	HA 80/99	Nature Conservation Advice in Relation to Bats	May 1999	10.4.3
	HA 81/99	Nature Conservation Advice in Relation to Otters	May 1999	10.4.4
	HA 83/99	Safety Aspects of Road Edge Drainage Features	Nov 1999	4.2.4
	HA 84/01	Nature Conservation and Biodiversity (supersedes the section in HA 59/92 (Nature Conservation). Mitigating Against Effects on Badgers is extant in 10.4.2)	Feb 2001	10.4.1
Advice Notes – Highways (HA Series)				
	HA 85/01	Road Improvement within Limited Land Take	Feb 2001	10.2.1
	HA 86/01	Principles and Guidance	Feb 2001	10.0.1
	HA 87/01	Environmental Functions	Feb 2001	10.0.2
	HA 88/01	Landscape Elements	Feb 2001	10.0.3
	HA 89/01	Environmental Elements	Feb 2001	10.0.4
	HA 90/01	Planning and Policy Features	Feb 2001	10.0.5
	HA 91/01	Environmental Database System	Feb 2001	10.0.6
	HA 92/01	Scheme Development, Implementation and Management	Feb 2001	10.0.7
	HA 93/01	Contract Performance Requirements	Feb 2001	10.0.8
	HA 94/01	Glossary of Terms	Feb 2001	10.0.9
	HA 97/01	Nature Conservation Management Advice in Relation to Dormice	Feb 2001	10.4.5
	HA 98/01	Nature Conservation Management Advice in Relation to Amphibians	Feb 2001	10.4.6
	HA 99/01	Policy and Guidance	Feb 2001	10.7.1
	HA 102/00	Spacing of Road Gullies	Nov 2000	4.2.3
	HA 103/06	Vegetative Treatment Systems for Highway Runoff	May 2006	4.2.1
	HA 104/09	Chamber Tops and Gully Tops for Road Drainage and Services: Installation and Maintenance	Nov 2009	4.2.5
	HA 105/04	Sumpless Gullies	Feb 2004	4.2.3
	HA 106/04	Drainage of Runoff from Natural Catchments	Feb 2004	4.2.1
	HA 107/04	Design of Outfall and Culvert Details	Nov 2004	4.2.7
	HA 108/04	The Landscape Management Handbook	Nov 2004	10.3.2
	HA 113/05	Combined Channel and Pipe System for Surface Water Drainage	Feb 2005	4.2.6
	HA 115/05	The establishment of An Herbaceous Plant Layer In Roadside Woodland	Feb 2005	10.3.3

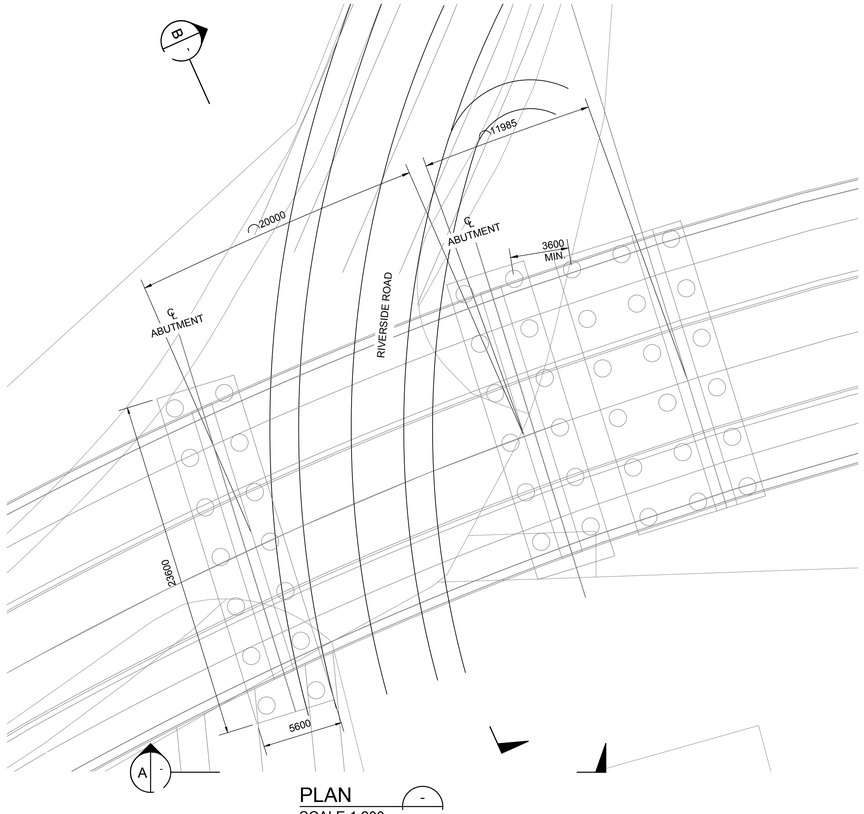
	HA 116/05	Nature Conservation Advice in Relation to Reptiles and Roads	May 2005	10.4.7
	HA 117/08	Cultural Heritage Asset Management Plans	Aug 2008	10.6.2
	HA 118/06	Design of Soakaways	May 2006	4.2.8
	HA 119/06	Grassed Surface Water Channels for Highway Runoff	May 2006	4.2.9
	HA 120/08	Guidance on The Trenchless Installation of Services Beneath Motorways and Trunk Roads	Aug 2008	4.1.8
	HA 200/08	Aims and Objectives of Environmental Assessment Correction No. 1	Aug 2008 Aug 2009	11.1.1
	HA 201/08	General Principles and guidance of Environmental Impact Assessment	Aug 2008	11.2.1
	HA 202/08	Environmental Impact Assessment	Aug 2008	11.2.2
	HA 204/08	Scoping of Environmental Impact Assessments	Aug 2008	11.2.4
Advice Notes – Highways (HA Series)				
	HA 205/08	Assessment and Management of Environmental Effects	Aug 2008	11.2.5
	HA 207/07	Air Quality	May 2007	11.3.1
	HA 208/07	Cultural Heritage	Aug 2007	11.3.2
	HA 217/08	Alternative Filter Media and Stabilisation Techniques for Combined Surface and Sub-Surface Drains	Aug 2008	4.2.4
	HA 218/08	Glossary of Terms Used in The Design Manual for Roads and Bridges Volume 11 Sections 1 and 2	Aug 2008	11.2.7
	HA 219/09	Determination of Pipe Roughness and Assessment of Sediment Deposition to Aid Pipeline Design	Nov 2009	4.2.4
Highways, Standards (HD Series)				
	HD 19/15	Road Safety Audit	Mar 2015	5.2.2
	HD 20/05	Detector Loops for Motorways	Nov 2005	9.3.1
✓	HD 22/08	Managing Geotechnical Risk	Aug 2008	4.1.2
	HD 23/99	General Information	Feb 1999	7.1.1
	HD 24/06	Traffic Assessment Correction No. 1	Feb 2006 Nov 2006	7.2.1
	HD 26/06	Pavement Design	Feb 2006	7.2.3
	HD 27/15	Pavement Construction Methods	Sep 2015	7.2.4
	HD 28/15	Skidding Resistance	July 2015	7.3.1
	HD 29/08	Data for Pavement Assessment	May 2008	7.3.2
	HD 30/08	Maintenance Assessment Procedure	May 2008	7.3.3
	HD 31/94	Maintenance of Bituminous Roads Amendment No. 1 Amendment No. 2	Jan 1994 Mar 1995 Feb 1998	7.4.1
	HD 32/94	Maintenance of Concrete Roads	Jan 1994	7.4.2
	HD 33/16	Surface and Sub-Surface Drainage Systems for Highways	May 26	4.2.3

	HD 35/04	Conservation and The Use of Secondary and recycled Materials	Nov 2004	7.1.2
	HD 36/06	Surfacing Materials for New and Maintenance Construction	Nov 2006	7.5.1
	HD 37/99	Bituminous Surfacing Materials and Techniques Amendment No. 1	Feb 1999 May 1999	7.5.2
	HD 38/97	Concrete Surfacing and Materials Amendment No. 1	Aug 1997 Feb 1999	7.5.3
	HD 39/01	Footway Design	May 2001	7.2.5
	HD 41/15	Maintenance of Highway Geotechnical Assets	July 2015	4.1.3
Highways, Standards (HD Series)				
	HD 43/04	Drainage Data Management System for Highways	Nov 2004	4.2.4
	HD 44/09	Assessment of Implications (of Highways and/or Roads Projects) on European Sites (Including Appropriate Assessment)	Feb 2009	11.4.1
	HD 45/09	Road Drainage and The Water Environment	Nov 2009	11.3.10
	HD 47/08	Screening of Projects for Environmental Impact Assessment	Aug 2008	11.2.3
	HD 48/08	Reporting of Environmental Impact Assessment	Aug 2008	11.2.6
	HD 49/16	Highway Drainage Design Principal requirements	May 2016	4.2.1
	HD 50/16	The certification of Drainage Design	May 2016	4.2.1
	HD 213/11	Noise and Vibration Revision 1	Feb 2011 Nov 2011	11.3.7

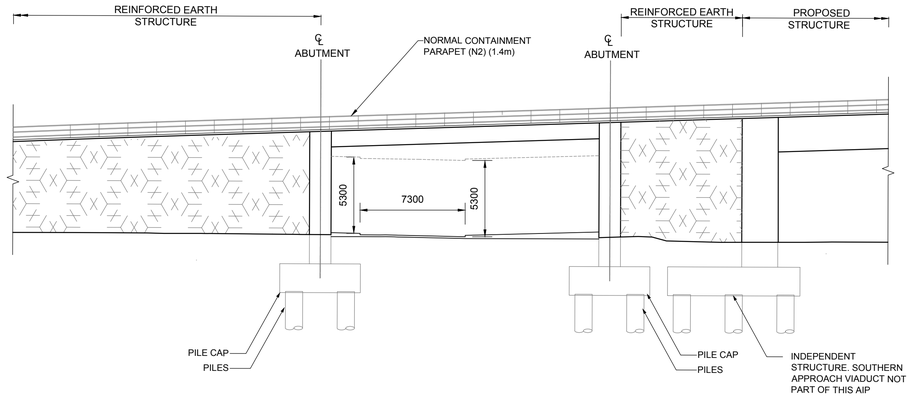
Roads Service Policy, Interim Advice and Miscellaneous

Used	Document Ref	Title	Date
✓	IAN 41/02	European cement standards	Jan 02
✓	IAN 48/03	Measures to minimise the risk of sulphate attack (including thaumasite) – New construction and structures under construction	Jan 03
	IAN 49/13	Use of warning signs for new asphalt road surfaces	Feb 13
✓	IAN 69/05	Designing for maintenance	Dec 05
✓	IAN 70/06	Implementation of new reinforcement standards (BS4449:2005, BS4482:2005, BS4483:2005 and BS8666:2005)	Jan 06
✓	IAN 95/07	Revised guidance regarding the use of BS8500:2006 for the design and construction of structures using concrete	May 07
✓	IAN 96/07r1	Guidance on implementing results of research on bridge deck waterproofing	Aug 07
✓	IAN 105/08	Implementation of construction (design and management) 2007 and the withdrawal of SD 10 and SD 11	Jan 08
✓	IAN 117/08 r2	Certification of combined kerb and drainage products	Jun 10
✓	IAN 124/11	Use of Eurocodes for the design of highway structures	Jul 11
✓	IAN 131/11	Deflection of permanent formwork	May 11
✓	IAN 154/12	Revision of clause 903, clause 921 and clause 942	Sep 12
✓	CIRIA C543	Bridge Detailing Guide	
✓	CIRIA C660	Early Thermal Cracking	
✓	CIRIA C686	Safe access for maintenance and repair	
✓	CIRIA R155	Bridges - design for improved durability	

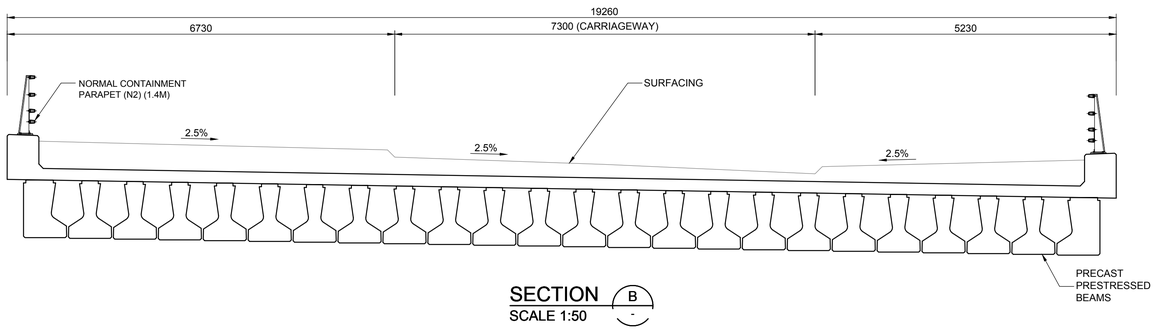
APPENDIX B – General arrangement drawings



PLAN
SCALE 1:200 (-)

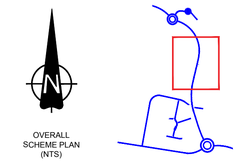


ELEVATION (A)
SCALE 1:200 (-)



SECTION (B)
SCALE 1:50 (-)

DRAFT AND CONFIDENTIAL



OVERALL
SCHEME PLAN
(NTS)

LEGEND

NOTES

1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.

P02	EL	FQ	MN	05/12/2017
AMENDMENTS				
P01	EL	FQ	MN	03/10/2017
FIRST ISSUE				
REVISION	**DRAWN**	**CHECKED**	**APPROVED**	**DATE**

DESCRIPTION

Suffolk County Council

PROJECT TITLE
Lake Lothing THIRD CROSSING

DRAWING TITLE
GENERAL ARRANGEMENT:
RIVERSIDE ROAD ACCESS
PORTAL FRAME

DRAWING STATUS
OAIP

DRAWN	CHECKED	APPROVED	AUTHORISED	SUITABILITY
EL	RR	FQ	MN	S0

SCALE @ A1 SIZE	DATE	REVISION
AS SHOWN	03/10/2017	P02

DRAWING NUMBER

Project	Originator	Volume	Location	Type	Role	Number
1069948	WSP	SGN	LL_	C19	DR	CB-0013

APPENDIX C – Designer Risk Assessment

Hazard information							Initial risk				Designer mitigation (POP and ERIC)		Residual risk				Review
Hazard Checklist ref	Unique ref	Design discipline	Designer	Activity/element	Stage	Hazard/ H&S issue	Initial RAG	Initial L	Initial S	Initial risk rating	Designer mitigation (POP and ERIC)	Designer actions	Residual RAG	Residual L	Residual S	Residual risk rating	Hazard /risks review date
		S	Furqan Qamar	Unforseen ground conditions	C	Inadequacy of design, cost implications	A	5	4	20	Planned Geotech investigations, obtained historical data	update design based on GI results and GDR.	R	2	3	6	01/12/2017
		S	Furqan Qamar	Temporary instability of structural elements.	C	Precast beams fall/ injuries or death	A	3	6	18	detailed design, contact with the specialist, appointment of competent contractor	Preliminary calculations outline design, early contractor involvment	A	2	6	12	01/03/2018
		S	Furqan Qamar	Inadequate clearance (both vertical and lateral)	C	Disruption to Nexen.	R	3	6	18	Liasion with Nexen, Identify their requirements	Provide adequate vertical and horizontal clearance, identify method of construction	G	1	4	4	
		S	Furqan Qamar	Craning or lifting operations.	C	Fall of objects from height.	A	3	5	15	Reduction is achieved by appointing specilist contractor.	minimize activiites involving fall of height					
		S	Furqan Qamar	Risk of settlement of structures	C	Collapse of structure	A	3	6	18	Reduction is achieved by geotechnical investigation, monitoring settlement on site and introducing some level of settlement in the desing of the bridge.	Preliminary calculations outline design, early contractor involvment	A	2	5	10	
		S	Furqan Qamar	Delay in geotech investigation	C	Delay in the design stage, Inadequacy of design	A	3	5	15	Responsible team involved to ensure geotech investigation is carried out on time	Update design based on GI results and GDR.	A				
		S	Furqan Qamar	Presence of unknown services on land.	C	Electrocution/disruption to services.	A	3	5	15	Undertake service investigation prior to detail design	Avoid services/utilites in the design					
Insert above this line																	

APPENDIX D – Technical Note for Costing

Technical Note

Lake Loathing Third Crossing, Portal Frame options comparison

Lake Lothing Third Crossing (LL3X)

04 Dec 2017
Produced for
Suffolk County Council

Prepared by
Furqan Qamar

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Document Control Sheet

Project Title	Lake Lothing Third Crossing (LL3X)
Report Title	Lake Loathing Third Crossing, Portal frame options comparison
Report ref no.	1069948-MOU-SGN-LL_C13-CD-CB-0006
Version	P01
Status	S3
Report Date	04 Dec 2017

Record of Issue

Version	Status	Author	Date	Checked by	Date	Approved by	Date
P01	Draft	RRomero	04/12/2017	Furqan Qamar	05/12/2017	Furqan Qamar	05/12/2017
P02	Draft	RRomero	07/12/2017	Furqan Qamar	08/12/2017	Furqan Qamar	08/12/2017

Distribution

Date	Organisation	Contact	Format	Copies

Limitations

This report is presented to Suffolk County Council in respect of Lake Lothing Third Crossing and may not be used or relied on by any other person. It may not be used by Suffolk County Council in relation to any other matters not covered specifically by the agreed scope of this Report.

Notwithstanding anything to the contrary contained in the report, Mouchel Limited is obliged to exercise reasonable skill, care and diligence in the performance of the services required by Suffolk County Council and Mouchel Limited shall not be liable except to the extent that it has failed to exercise reasonable skill, care and diligence, and this report shall be read and construed accordingly.

This report has been prepared by Mouchel Limited. No individual is personally liable in connection with the preparation of this report. By receiving this report and acting on it, the client or any other person accepts that no individual is personally liable whether in contract, tort, for breach of statutory duty or otherwise.

Contents

1. Introduction

The purpose of this technical note is to summarize the different options that have been considered to provide access to Nexen. This note includes a brief description of the options considered and the whole life cost of each of them.

2. Portal frame structure options

The scheme requires a structure to provide access to Nexen. Herein are listed the several options consider to satisfy this access.

2.1. Structure Providing Access to Nexen

The clear span of this bridge is currently 20m between abutment faces with a skew of approx. 8 degrees. Options considered are as listed below.

2.1.1. Portal frame structure, with precast beam deck

The portal frame will be comprising precast pre-stressed beam deck integral with reinforced concrete abutments, supported on piles. This option provided the lowest capital and whole life cost due to the precast beam deck and the low maintenance requirements.

2.1.2. Steel Superstructure,

A steel superstructure supported on reinforced concrete abutments. The abutments, in turn, will be supported on piles. The superstructure will be integral with the abutments. Steel superstructure for this span is inefficient and results in higher capital cost and whole life cost due to maintenance requirements associated with steel structures such as re-paining every 25 years

2.1.3. Reinforced concrete portal type structure

Reinforced concrete portal structure comprising in situ reinforced concrete deck integral with reinforced concrete abutments supported on reinforced concrete spread foundations. This option was will result in higher capital cost due to temporary works requirements during construction.

2.1.4. Integration of this span in the south approach viaduct

This option would have been suitable and aesthetically better in comparison to the previous options, however due to headroom requirements (6.1m) it is not feasible to integrate this structure with the south approach viaduct. Cost for this option is not estimated because this option does no fulfil the design constrains

3. Cost summary

	Option Cost for Under-pass	Capital Cost of Underpass £	Total Life Cycle Interventions (Discounted Value)	Total Dis-counted WLC of Underpass	Description of Maintenance Work
2.1.1	Precast Concrete Beams	2,190,000	36,000	2,226,000	Minor repairs (5% of precast beams area) to damaged con-crete every 40 years. Repairs (15% of walls) to damaged concrete every 40 years.
2.1.2	Steel Girders	2,320,000	220,000	2,540,000	Painting 50% of steelwork at 15, 40, 65, 90 & 115 years. Painting 100% of steelwork at 25, 50, 75 and 100. Repairs (15% of walls) to damaged concrete every 40 years
2.1.3	Insitu Option	2,360,000	52,000	2,412,000	Repairs (15% of deck) to dam-aged concrete every 40 years. Repairs (15% of walls) to damaged concrete every 40 years

4. Conclusion

Based on whole life costing exercise, precast concrete beam provided the lowest capital and whole life cost due to low maintenance requirements, therefore this option will be preferred.

5. Appendix A

Detailed Breakdown of Whole Life Costing

ESTIMATE CONTROL SHEET

PROJECT NAME: LAKE LOTHING UNDERPASS OPTIONS - WHOLE LIFE COSTS

ESTIMATE REFERENCE: ORDER OF MAGNITUDE ESTIMATE

VERSION	PREPARED BY	CHECKED / APPROVED BY	AUTHORISED BY
1.0	A Rana	S Keeley	S Keeley
	01/12/2017	01/12/2017	01/12/2017
1.0	A Rana	S Keeley	S Keeley
	08/12/2017	08/12/2017	08/12/2017

LAKE LOTHING - UNDERPASS OPTIONS

ROUGH ORDER OF MAGNITUDE ESTIMATE

SUMMARY OF OPTION STUDY WHOLE LIFE COSTS

	Option Cost for Underpass	Capital Cost of Underpass £	Total Life Cycle Interventions (Discounted Value)	Total Discounted WLC of Underpass	Description of Maintenance Work
1	Steel Girders	2,320,000	220,000	2,540,000	Painting 50% of steelwork at 15, 40, 65,90 & 115 years. Painting 100% of steelwork at 25,50,75 and 100 Repairs (15% of walls) to damaged concrete every 40 years
2	Precast Concrete Beams	2,190,000	36,000	2,226,000	Minor repairs (5% of pcc beams area) to damaged concrete every 40 years. Repairs(15% of walls) to damaged concrete every 40 years.
3	Insitu Option	2,360,000	52,000	2,412,000	Repairs (15% of deck) to damaged concrete every 40 years. Repairs (15% of walls) to damaged concrete every 40 years

Exclusions

Demolitions
Land acquisition
Waterproofing,roadworks generally,
Programme considerations
STATS
VAT
Future Inflation beyond 4Q 2017
Legal issues

Cost estimates are based on the following documents:
Portal frame steel option - 1069948-WSP-SGN-LL_C19-DR-CB-0050
Portal frame PCC option - 1069948-WSP-SGN-LL-DR-CB-0013
Drg 1069948 - MOU - SGN - LL C13 - DR - CB - 0011

LAKE LOTHING - UNDERPASS OPTIONS

ROUGH ORDER OF MAGNITUDE ESTIMATE

SUMMARY OF OPTION STUDY WHOLE LIFE COSTS - DISCOUNTED

Discounted rate 3.5 Based on the Green Book

In situ Cantilever Concrete Repairs Every 40 years		Precast Beam Concrete Repairs Every 40 years	
Amount	Years	Amount	Years
£160,000		£110,000	
£41,000	40	£28,000	40
£11,000	80	£8,000	80
£52,000	40 and 80	£36,000	40 and 80

Steel					
Painting to 50% of steel		Painting to 100% of steel		Concrete repairs every 40 years	
Amount	Years	Amount	Years	Amount	Years
£80,000		£160,000		£60,000	
£48,000	15	£68,000	25	£16,000	40
£21,000	40	£29,000	50	£4,000	80
£9,000	65	£13,000	75		
£4,000	90	£6,000	100		
£2,000	115				
£84,000.00	15,40,65,90 & 115	£116,000.00	25,50,75 & 100	£20,000.00	40 & 80
	Total		£220,000.00		

5.50 The mathematical expressions used to calculate discounted present values are set out in the footnote below.[9]

[9] Year 0 is the present. Accordingly, the present value, at the middle of year 0, of a payment of £1 made at the middle of year n is given by:

$$D_n = \frac{1}{(1+r)^n}$$

where r is the discount rate and Dn is the discount factor. For example, a payment of £150 at the middle of year 5 has a present value at the middle of year 0 of:

$$£150 \times \frac{1}{(1.035)^n} = £150 \times 0.8420 = £126.30$$

LAKE LOTHING - UNDERPASS OPTIONS

ROUGH ORDER OF MAGNITUDE

SUMMARY OF OPTION STUDY CAPITAL COSTS

Option	Total Cost
Steel Option	£2,320,000
Precast Beam Option	£2,190,000
Insitu Option	£2,360,000

Exclusions

Demolitions
Land acquisition
Waterproofing,roadworks generally,
Programme considerations
STATS
VAT
Future Inflation beyond 4Q 2017
Legal issues

Cost estimates are based on the following documents:
Portal frame steel option - 1069948-WSP-SGN-LL_C19-DR-CB-0050
Portal frame PCC option - 1069948-WSP-SGN-LL-DR-CB-0013

LAKE LOTHING - UNDERPASS OPTIONS

ROUGH ORDER OF MAGNITUDE ESTIMATE

SUMMARY OF LIFE CYCLE INTERVENTION COSTS

Option	Total Cost per Intervention
Steel option - Painting Steel (50%)	£80,000
Steel Option- Painting Steel (100%)	£160,000
Steel Option - Repairs to Concrete Walls	£60,000
PCC Beam - Repairs to Concrete	£110,000
Insitu Option - Repairs to Concrete	£160,000

Exclusions

Demolitions
Land acquisition
Waterproofing,roadworks generally,
Programme considerations
STATS
VAT
Future Inflation beyond 4Q 2017
Legal issues

Cost estimates are based on the following documents:
Portal frame steel option - 1069948-WSP-SGN-LL_C19-DR-CB-0050
Portal frame PCC option - 1069948-WSP-SGN-LL-DR-CB-0013

Client	**Lake Lothing Third Crosiing**
Project:	**Lake Lothing Bridge - Steel Option - Painting 50% of Steelwork**
Title:	**Initial guide price estimate for Life Cycle Intervention Cost for Painting Steel**

Location details	**Construction considered**	**Area**	**Unit**	**Approx. all in rate**		**Amount**	**Notes/assumptions**
Early stage costings for an approximate budget allowance only (pricing deemed current Q4 2017							***General assumptions :***
Elemental costs only considered in the main				All inclusive roadworks rates used			**Normal hours working** **Reasonable levels of productivity**
Painting of Viaduct steelwork	Scaffolding	384	sq m	40		15,400	
	Containment Sheeting	384	sq m	15		5,800	
	Maintenance Painting down to sound paint	403	sq m	41		16,503	
					sub-total	38,000	
	Items of construction contingency for items not identified and precise detail/spec			allowed at	0.0%	0	
	Preliminaries/TM/OH & P			allowed at	30%	11,000	
				Approximate basic construction costs		**49,000**	
ADD Other considerations							
	Work by Statutory undertakers and others	allowed at		allowed at	0.0%	0	
	Survey/Investigate/Design/Procure/Supervise/manage & liase			allowed at	16%	8,000	
		sub-Total incl Stats/Others & Design etc. but excl risk				**57,000**	
	Risk/Optimism Bias/contingency	only illustrative details		allowance currently made	**40%**	23,000	
				Approximate Indicative Total Budget Estimate		**80,000**	

Exclusions

Demolitions
Land acquisition
Waterproofing,roadworks generally,
Programme considerations
STATS
VAT
Future Inflation beyond 4Q 2017
Legal issues

Cost estimates are based on the following documents:
Portal frame steel option - 1069948-WSP-SGN-LL_C19-DR-CB-0050

Client	**Lake Lothing Third Crosiing**
Project:	**Lake Lothing Bridge - Steel Option - Painting 100% of Steelwork**
Title:	**Initial guide price estimate for Life Cycle Intervention Cost for Painting Steel**

Location details	Construction considered	Area	Unit	Approx. all in rate		Amount	Notes/assumptions
Early stage costings for an approximate budget allowance only (pricing deemed current Q4 2017							***General assumptions :***
Elemental costs only considered in the main				All inclusive roadworks rates used			**Normal hours working** **Reasonable levels of productivity**
Painting of Viaduct steelwork	Scaffolding	384	sq m	40		15,400	
	Containment Sheeting	384	sq m	15		5,800	
	Maintenance Painting down to clean steel	805	sq m	65		52,325	
					sub-total	74,000	
	Items of construction contingency for items not identified and precise detail/spec			allowed at	0.0%	0	
	Preliminaries/TM/OH & P			allowed at	30%	22,000	
				Approximate basic construction costs		**96,000**	
ADD Other considerations							
	Work by Statutory undertakers and others	allowed at		allowed at	0.0%	0	
	Survey/Investigate/Design/Procure/Supervise/manage & liase			allowed at	16%	15,000	
				sub-Total incl Stats/Others & Design etc. but excl risk		**111,000**	
	Risk/Optimism Bias/contingency	only illustrative details		allowance currently made	**40%**	44,000	
				Approximate Indicative Total Budget Estimate		**155,000**	

Exclusions

Demolitions
Land acquisition
Waterproofing,roadworks generally,
Programme considerations
STATS
VAT
Future Inflation beyond 4Q 2017
Legal issues

Cost estimates are based on the following documents:
Portal frame steel option - 1069948-WSP-SGN-LL_C19-DR-CB-0050

Client	**Lake Lothing Third Crosiing**
Project:	**Lake Lothing Bridge - Steel Option - Minor Concrete Repairs**
Title:	**Initial guide price estimate for Life Cycle Intervention Cost for Concrete Repairs**

Location details	**Construction considered**	**Area**	**Unit**	**Approx. all in rate**		**Amount**	**Notes/assumptions**
Early stage costings for an approximate budget allowance only (pricing deemed current Q4 2017							
Elemental costs only considered in the main				All inclusive roadworks rates used			***General assumptions :*** **Normal hours working** **Reasonable levels of productivity**
Concrete repairs to walls	Assume 15% area 125mm thick	47	sq m	550		25,659	
					sub-total	26,000	
	Items of construction contingency for items not identified and precise detail/spec			allowed at	0.0%	0	
	Preliminaries/TM/OH & P			allowed at	30%	8,000	
				Approximate basic construction costs		**34,000**	
ADD Other considerations							
	Work by Statutory undertakers and others	allowed at		allowed at	0.0%	0	
	Survey/Investigate/Design/Procure/Supervise/manage & liase			allowed at	16%	5,000	
				sub-Total incl Stats/Others & Design etc. but excl risk		**39,000**	
	Risk/Optimism Bias/contingency	only illustrative details		allowance currently made	**40%**	16,000	
				Approximate Indicative Total Budget Estimate		**55,000**	

Exclusions

Demolitions
Land acquisition
Waterproofing,roadworks generally,
Programme considerations
STATS
VAT
Future Inflation beyond 4Q 2017
Legal issues

Cost estimates are based on the following documents:
Portal frame steel option - 1069948-WSP-SGN-LL_C19-DR-CB-0050

Client	**Lake Lothing Third Crosiing**
Project:	**Lake Lothing Bridge PCC Beam Option - Minor Concrete Repairs**
Title:	**Initial guide price estimate per intervention**

Location details	Construction considered	Area		Unit	Approx. all in rate		Amount		Notes/assumptions
Early stage costings for an approximate budget allowance only (pricing deemed current Q4 2017									***General assumptions :***
Elemental costs only considered in the main					All inclusive roadworks rates used				**Normal hours working** **Reasonable levels of productivity** **No contaminated materials**
	Scaffolding	384		sq m	40		15,400		
	Containment Sheeting	384		sq m	15		5,800		
	Assume 5% of beams @ 50mm depth	19		sq m	325		6,200		
Concrete repairs to walls	Assume 15% area 125mm thick	47		sq m	550		25,659		
						sub-total	53,000		
	Items of construction contingency for items not identified and precise detail/spec				allowed at	0.0%	0		
	Preliminaries/TM/OH & P				allowed at	30%	16,000		
					Approximate basic construction costs		**69,000**		
ADD Other considerations									
	Work by Statutory undertakers and others	allowed at			allowed at	0.0%	0		
	Survey/Investigate/Design/Procure/Supervise/manage & liase				allowed at	16%	11,000		
		sub-Total incl Stats/Others & Design etc. but excl risk					**80,000**		
	Risk/Optimism Bias/contingency	only illustrative details			allowance currently made	**40%**	32,000		
		Approximate Indicative Total Budget Estimate					**112,000**		

Exclusions

Demolitions
Land acquisition
Waterproofing,roadworks generally,
Programme considerations
STATS
VAT
Future Inflation beyond 4Q 2017
Legal issues

Cost estimates are based on the following documents:
Portal frame PCC option - 1069948-WSP-SGN-LL-DR-CB-0013

Client	**Lake Lothing Third Crosiing**
Project:	**Lake Lothing Bridge Insitu Option - Minor Concrete Repairs**
Title:	**Initial guide price estimate per intervention**

Location details	Construction considered	Area		Unit	Approx. all in rate		Amount		Notes/assumptions
Early stage costings for an approximate budget allowance only (pricing deemed current Q4 2017									***General assumptions :***
Elemental costs only considered in the main					All inclusive roadworks rates used				**Normal hours working** **Reasonable levels of productivity** **No contaminated materials**
	Scaffolding	384		sq m	40		15,300		
	Containment Sheeting	384		sq m	15		5,800		
Concrete repairs to slab	Assume 15% of exposed concrete @ 125mm depth	58		sq m	550		31,648		
Concrete repairs to walls	Assume 15% area 125mm thick	47		sq m	550		25,659		
						sub-total	78,000		
	Items of construction contingency for items not identified and precise detail/spec				allowed at	0.0%	0		
	Preliminaries/TM/OH & P				allowed at	30%	23,000		
						Approximate basic construction costs	**101,000**		
ADD Other considerations									
	Work by Statutory undertakers and others	allowed at			allowed at	0.0%	0		
	Survey/Investigate/Design/Procure/Supervise/manage & liase				allowed at	16%	16,000		
					sub-Total incl Stats/Others & Design etc. but excl risk		**117,000**		
	Risk/Optimism Bias/contingency	only illustrative details			allowance currently made	**40%**	47,000		
						Approximate Indicative Total Budget Estimate	**164,000**		

Exclusions

Demolitions
Land acquisition
Waterproofing,roadworks generally,
Programme considerations
STATS
VAT
Future Inflation beyond 4Q 2017
Legal issues

Cost estimates are based on the following documents:
Dwg from Paul Caine on 07/02/17
Telephone discussion with Tayeb Kemezi on 07/02/17
Drg 1069948 - MOU - SGN - LL C13 - DR - CB - 0011

Client Lake Lothing Third Crosiing

Project: Lake Lothing Bridge

Title: Rates used in Initial guide price estimate for Life Cycle Interventions

Location details	Construction considered	Quantity	Unit	Rate	Amount	Notes/assumptions
Early stage costings for comparative purposes only (pricing deemed current 1Q 2017)						
Rate Build Ups						
Painting						
Steelwork	Scaffolding		m2	£40		Hadley Scaffolding target cost (Dave Taylor 01634-566-979)
	Containment Sheeting		m2	£15		Hadley Scaffolding target cost (Dave Taylor 01634-566-979)
	Painting		m2	£41		Spons HW 2017 - Maintenance painting down to sound paint
			m2	£65		Based on Area 13 Tebay Deck Refurb 2013 rates updated to 1Q'17 down to clean steel
Concrete Repairs	50mm thick					Based on Area 13 Tebay Deck Refurb 2013 rates updated to 1Q'17
	Break out		m2	£70		
	Concrete		m2	£80		
	Formwork		m2	£175		
				£325		
	125mm thick to slab					
	Break out		m2	£175		
	Concrete		m2	£200		
	Formwork		m2	£175		
				£550		
	Post Tensioning		t	£9,000		80% uplift on normal rate based on Area 13 Tebay Deck Refurb uplift for reinforcement in concrete repairs
assumptions/allowa	*Prepared by Steve Keeley 20/1/17 for Mouchel*					

Exclusions

Demolitions
Land acquisition
Waterproofing,roadworks generally,
Substructure (Piers/Abutments/Piling/Fenders etc)
Bascule Bridge
Programme considerations
STATS
VAT
Future Inflation beyond 1Q 2017
Legal issues

Cost estimates are based on the following documents:
Email from Ricardo Romero dated 6/1/17 (Steel Girder sizing)
Email from Masood Chowdhury dated 21/11/16 (Precast Beam Spec)
Dwg 1069948/MOU/SGN/005 (Steel Girder and PCC Long Section)
Dwg 1069948/MOU/SGN/006 (Steel Girder and PCC Beam Arrangement)
Dwg 1069948/MOU/SGN/010 (Post Tensioned Insitu Cantilever Deck Cross Sections)
Dwg 1069948/MOU/SGN/011 (Post Tensioned Insitu Cantilever Deck Long Section)