



Approval in Principle

BB1440 – Robroyston Proposed Footbridge

Project Name: Robroyston Proposed Footbridge

Document Title: Approval in Principle

Document No: BB1440-AIP-01

Version	Issue	Prepared by: Date:	Checked by: Date:
0	First Issue	UJ 09/02/2021	SH 09/02/2021
1	Revised to suit Cat3 Checker and TS comments	UJ 19/07/2021	SH 19/07/2021
2	Section 3.5 updated	UJ 22/07/2021	SH 22/07/2021
3	Sections 3.1, 3.7 & 4.1.7 updated	UJ 06/09/2021	SH 06/09/2021
4	Section 4.8 updated	UJ 22/10/2021	SH 22/10/2021

1. HIGHWAY DETAILS

1.1 Type of highway:

Over A proposed shared footway and cycle way linking up the north of Robroyston to the south over the M80.

Under The road directly beneath the proposed bridge is the M80, a dual lane motorway with hard shoulders and on/off slips. This section of the trunk road network is managed under a Design, Build, Finance, and Operate contract.

1.2 Permitted traffic speed over and/or under:

Over Not applicable

Under 70mph

1.3 Existing restrictions:

No known restrictions.

2. SITE DETAILS

The Ordinance Survey Grid Reference for the proposed bridge structure, at the centre of its span is NS 64264 68786.

2.1 Obstacle crossed:

The proposed bridge crosses over the M80 approximately 500m to the east of Junction 2.

3. **PROPOSED STRUCTURE**

3.1 **Description of structure and design working life:**

The proposed footbridge forms part of a wider development scheme comprising of up to 1600 new homes with associated amenities and the recently constructed Robroyston Railway Station. The purpose of the bridge is to create a dedicated pedestrian and cycle link over the M80 as defined within the Section 42 Application Supporting Transport Statement.

The proposed bridge is a single span Warren truss with partial overhead bracing. The bridge deck will have a minimum clear width of 3.5m to accommodate unsegregated pedestrians and cyclists. The maximum gradient on the bridge deck will be 1 in 22 therefore no handrail is to be provided. Parapets will be a minimum of 1.8m high. A parapet height of 1.8m is normally specified for bridges with equestrian use. The proposed bridge has not been designed for equestrian use and the parapet height is to reduce the risk of self-harm. Head height clearance to any overhead structural element will be maintained at a minimum of 3.0m to deter unwanted access and promote a greater sense of openness.

At the proposed crossing the M80 is higher than the adjacent land parcels, with both sites falling away perpendicular to the road. To create a softer engineered solution for the approaches, the proposed ramps up to the bridge are formed in earthworks for their entirety and have been set out in a switch back formation. This arrangement allows the stepped access to become a direct route, crossing the ramp, and making the whole solution integrated. Large landings have been provided to avoid conflict between users and are set out in accordance with regulations. All ramps will have a maximum gradient of 1 in 20, utilising 1 in 22 slopes where possible. Ramps will be a minimum of 3m wide with steps proposed as 2m wide. High volumes of pedestrian are not expected.

The earthwork approaches will incorporate reinforced slopes to limit their footprint and to allow better tie in with the surroundings.

The full height reinforced concrete abutments will have plain concrete surfaces with considered detailing to avoid staining.

It is proposed to paint the superstructure with a HAPAS approved Fluoropolymer paint system (topcoat - Item 195) for increased durability.

In accordance with CD350 the design working life of the proposed elements will be as follows:

Primary Bridge Structure	Category 5	>120 years
Reinforced Earth Slopes	Category 5	>120 years
All other Elements	Category 2	>50 years

A Stage 1 & 2 Road Safety Audit is to be conducted to check for road safety implications that the proposed scheme may impart. Recommendations from the audit be actioned accordingly.

3.2 Structural type:

The proposed structure is to be a single span simply supported bowed Warren truss with partial overhead bracing, fabricated from square and rectangular steel hollow sections. The deck will consist of stiffened 8mm thick steel plates. The bridge will be transported to site in two sections and bolted together in the site compound with a central splice prior to the final lift.

3.3 Foundation type:

The proposed reinforced concrete abutments and wingwalls will be supported by ground bearing spread foundations.

3.4 Span arrangements:

The bridge will have longitudinal bearing centres of 49.5m.

3.5 Articulation arrangements:

The bridge will be simply supported at each end using elastomeric bearings, arranged as such to allow both transverse and longitudinal movement at each end.

3.6 Classes and Levels:

3.6.1 Consequence Class:

CC3

3.6.2 Reliability Class:

RC3 with $K_{FI} = 1.0$

3.6.3 Inspection Level:

IL3

3.7 Road restraint system requirements:

The pedestrian parapets will be a minimum of 1.8m high to reduce the risk of self-harm. The parapets and parapet infill shall be designed for Class 3 and Class C to BS7818 respectively, (see Clause 4.7).

The existing Open Box Beam barriers to both verges of the M80 will remain in-situ. The proposed abutments are to be designed withstand the effects of collision for global design purposes hence in accordance with clause 3.46 of BS EN 1991-1-7 the containment class of N2 and the available working width of the existing system are suitably adequate.

3.8 Proposals for water management:

The bridge deck will be longitudinally cambered and additionally a cross fall incorporated into the deck plate, directing water to positively connected surface drains at each abutment.

The abutment bearing shelves will be detailed to effectively manage drainage.

3.9 Proposed arrangements for future maintenance and inspections.

3.9.1 Traffic management:

A temporary carriageway closure would be required to safely conduct any works to the bridge soffit and outside elevations over the highway.

3.9.2 Arrangements for future maintenance and inspection of the structure:

Access to the bridge surface can be undertaken on foot.

Access to the soffit can be gained via the use of a Mobile Elevated Working Platform under a carriageway closure.

Jacking locations will be provided for use in future bearing replacement.

3.10 Environment and sustainability:

The proposed steel superstructure construction allows for a high degree of prefabrication away from site. This will keep disruption to the site and local public during installation to a minimum.

Steel as used for the super structure is fully recyclable as is the concrete and reinforcement used for the abutments. The superstructure will be painted with an enhanced protection Fluoropolymer paint system, theoretically giving an extended serviceable life over a typical Polyurethane System.

Site won material is to be used to construct the earth embankment approaches, eliminating the need for cart away and the associated environmental impact.

3.11 Durability, materials, and finishes / materials strengths assumed and basis of assumptions:**3.11.1 Materials:**

Superstructure Steel: Main superstructure steelwork to be a minimum steel grade of S355 to BS EN 10025. Ancillary steelwork (e.g., kicker, cleats for parapets etc.) is to be a minimum of S275 or an equivalent higher grade.

All steelwork greater than 4mm thick will have a minimum sub-grade of J0. In accordance with PD6995-1-10 Table 4 (derived from BSEN 1990, BSEN1991-1-5 and BSEN 1993-1-10 and all applicable NA's) the maximum thickness of S275J0 steel permitted will be 30mm. Where S355J0 steel is used, the maximum thickness permitted will be 15mm. Thicknesses greater than these limits will be proved by further calculation to BSEN 1993-1-10 and the applicable NA. Note: there is a high probability that the subgrade of the supplied steel will be J2, the preceding permitted statements are put into place to cover any potential steel procurement issues.

Steel protection system: Fluoropolymer Type II (Inland difficult access) approved paint system to Specification for Highway Works Series 1900. Topcoat colour is to be confirmed.

Ancillary items such as parapets will have a contrasting topcoat applied to emphasise the truss form in accordance with C5.7 of CD 351.

Waterproofing: The steel deck plate is to receive a combined waterproofing and anti-skid surfacing with a slip resistance in accordance with CD 353 clause 9.5.

The bearing shelf is to be waterproofed with a HAPAS approved system.

Two coats of bituminous paint or equivalent to be applied to buried concrete surfaces accessible after casting in accordance with clause 2004 of the Specification for Highways Works.

Concrete:

Element	Strength Class in accordance with BS8500-1	Design Chemical Class	Exposure Class
Abutments	40/50	DC2*	XC3/4, XD3, XF4
Foundations	40/50	DC2*	XC3/4, XD3, XF4

* To be confirmed upon receipt of Geotechnical Design Report

Reinforcement:	High yield deformed bars (B500B or B500C to BS4449:2005) with a characteristic yield stress of 500N/mm ²
Elastomeric Bearings:	SK Bearing reference E500320(24.0)2437 (500 x 320 x 66mm) with a Shear Stiffness of 2.7kN/mm in the direction of the span.

Concrete finishes:

Element	Finish
Buried unformed surfaces	U1
Buried/hidden formed surfaces	F1
Exposed formed surfaces	F3
Exposed unformed surfaces	U3

Structural backfill: Class 6N/6P to abutments.

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

Refer to the Designer's Risk Register in Appendix B.

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

An estimated cost for the proposed scheme is £1,500,000.

A report was previously completed to inform the funding partners of their options for a proposed crossing of the M80 at a specified location. This explored varying bridge forms and approach arrangements with estimates of cost attributed to each. A steel Warren truss was selected for its efficiency with a bow top chord adding to aesthetic appeal. The earth works approaches are a soft engineered solution and are inherently low maintenance. In addition, this approach uses surplus material from the wider development sites. The proposed arrangement has been selected as it gives the best whole life cost of all those investigated. The options report has been previously submitted to Transport Scotland for review.

3.14 Proposed arrangements for construction:

3.14.1 Construction of Structure:

- Re-align buried high voltage cable.
- Construct new bridge abutments.
- Construct crane pad and laydown area to north of the M80.
- Transport prefabricated bridge sections (2 no.) to site and assemble.
- Erect crane (800 tonne preliminary estimate).
- Lift completed bridge into place during single overnight road closure.
- Dismantle crane.
- Build up earthworks forming ramps and stairs.
- Open bridge.

For bridge transport route and proposed laydown area/crane pad see drawing BB1440-2600-001 in appendix C.

3.14.2 Traffic Management:

A temporary overnight road closure would be required during the installation of the bridge. The crane and bridge will be positioned to the north of the M80, outside of the highway boundary.

3.14.3 Service Diversions:

No statutory undertakers' plant is to be supported from the bridge structure.

An existing buried High Voltage cable to the northeast of the south abutment is to be realigned prior to commencement of the works.

3.14.4 Interface with Existing Structures:

There is no immediate interface with any existing structures.

The overhead sign on the west bound carriageway to the west of the proposed bridge does not appear to be visually impeded by the proposed superstructure.

3.15 Resilience and Security

The resilience and security of the local road network will overall remain unchanged.

To reduce the risk of self-harm a minimum parapet height of 1.8m has been specified for the bridge.

The bridge supports will be designed to prevent the bridge from falling onto the carriageway in the event of a collision to the superstructure.

4. **DESIGN CRITERIA**

4.1 **Actions:**

4.1.1 **Permanent Action:**

Material densities and load factors will be as listed in BS EN 1990 and BS EN 1991 and associated UK National Annexes.

Material	Unit Density (kN/m ³)
Structural Steel	77.0
Reinforced Concrete	25.0
6N/6P structural backfill	19.0

4.1.2 **Snow, wind and thermal actions:**

Wind actions (BS EN 1991-1-4 & UK NA)

Thermal actions to be in accordance with BS EN 1991-1-5 Section 6 and UK NA.

Wind and thermal actions acting together will not be considered as per NA to BS EN 1990 NA.2.3.4.1 A2.2.3(2).

Snow actions will not be considered as per NA to BS EN 1990 NA.2.3.4.2 A2.2.3(3).

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

Not applicable for footbridges

4.1.4 **Actions relating to General Order traffic under STGO Regulations:**

Not applicable for footbridges

4.1.5 **Footway or footbridge variable actions:**

Pedestrian Loads in accordance with Section 5 of BSEN1991-2 and the NA to BSEN 1991-2

In accordance with BSEN1990 Annex A2 A2.4.3.2 (2) detailed dynamic analysis will be performed for fundamental frequencies below values of 5 Hz for vertical direction and 2,5 Hz for horizontal direction.

If required based on BSEN1990 Annex A2 A2.4.3.2 (2), bridge class for design crowd density determination will be Class B as per BS EN 1991-2, Table NA.7. The dynamic response limit of 1.30 m/s^2 will be used (based on NA.2.44.6 and Figure NA.10 of NA to BS EN 1991-2). This factor has been developed assuming:

$k_1 = 1.3$ (Suburban crossings)

$k_2 = 1.0$ (Primary Route)

$k_3 = 1.0$ (Bridge height 4m to 8m)

$k_4 = 1.0$ (no adjustment)

Logarithmic decrement of structural damping will be taken as 0.02 from Table F.2 of BS EN 1991-1-4 for welded steel bridges.

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

Not Applicable

4.1.7 Accidental actions:

Accidental actions will be considered in accordance with BS EN 1991-1-7 and UK NA.

The placement of bollards will prevent access to service vehicles hence this load will not be considered.

The connections between the bridge and abutment will be designed to prevent the bridge from falling from the supports in the event of a collision in accordance with 2.5.2 of PD6688-1-7:2009.

The abutments will be designed for global collision forces in accordance with 4.3.1. of BS EN 1991-1-7 and NA.2.11 of NA to BS EN 1991-1-7.

4.1.8 Actions during construction:

Actions on the superstructure while being lifted into position to be in accordance with 4.2 of BS EN 1991-1-6 and UK NA.

4.1.9 Any special action not covered above:

Not Applicable.

4.2 Heavy or high load route requirements and arrangements being made to preserve the route, including any provision for future heavier loads or further widening:

The need to consider heavy load route requirements are not applicable to footbridges.

The M80 at this point is not a high load route and is restricted in clearance by bridges fore and aft of the proposed footbridge. The Traffic Scotland freight map shows height restrictions of 5.49m at Junction 3 (struct. ref. M80 3-3 10) to the east and 5.42m at Robroyston Road overbridge (struct. ref. M80 1-2 50) to the west.

For buildability purposes the abutments have been set back further than the minimum requirement of 4.5m. This potentially affords more clearance for future road widening.

4.3 Proposed minimum headroom provided:

The minimum headroom over the highway below will be more than the 5.7m minimum requirement. The M80 has been surveyed over a 300m distance below the proposed bridge site and the carriageway is not on a sag curve hence this additional allowance is not required.

4.4 Authorities consulted and any special conditions required:

Glasgow City Council: The proposed footbridge is a planning condition for a wider residential development (planning ref. no: 18/01794/PPP). Details of the accepted proposal will be issued to the Planning Authority for a release of condition.

The Roads and Transport department have been consulted. They have specified the minimum parapet height over the bridge. No other requirements.

It is proposed that GCC will adopt the approach infrastructure to the bridge (earthwork ramps and steps).

Scottish Power: Relocation of the buried HV cable.

4.5 Standards and documents listed in the Technical Approval Schedule:

The date of the standards freeze has been assumed to be the date of the AIP submission. For a full list of the Technical Approval Standards, TAS, used within the detailed design of the bridge, please refer to Appendix A.

4.6 Proposed Departures relating to 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.

4.8 Proposed safety critical fixings:

- Superstructure fixing to the abutments to satisfy 2.5.2 of PD6688-1-7:2009.
- Superstructure central splice connection – As requested and agreed with the TAA, all components without redundancy shall be designed to achieve a ULS utilisation of <0.85.

5. STRUCTURAL ANALYSIS

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

The superstructure shall be analysed using a linear elastic 3D space frame with a commercial computer package such as Midas or Robot and also by simple hand calculations.

The substructure and foundations will be analysed by simple hand calculations.

Detailed design of the proposed reinforced earth slopes will be undertaken by a specialist manufacturer such as Tensar. The overall stability of the resulting embankment and its effects on the Road will be checked by the scheme's Geotechnical Advisor.

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

The truss will be treated as a pin jointed structure with the cross beam to web member connections having moment restraint. Additionally, this will form U-Frame restraints at the ends of the span where the overhead bracing is omitted. The deck will be considered to act compositely with the structure.

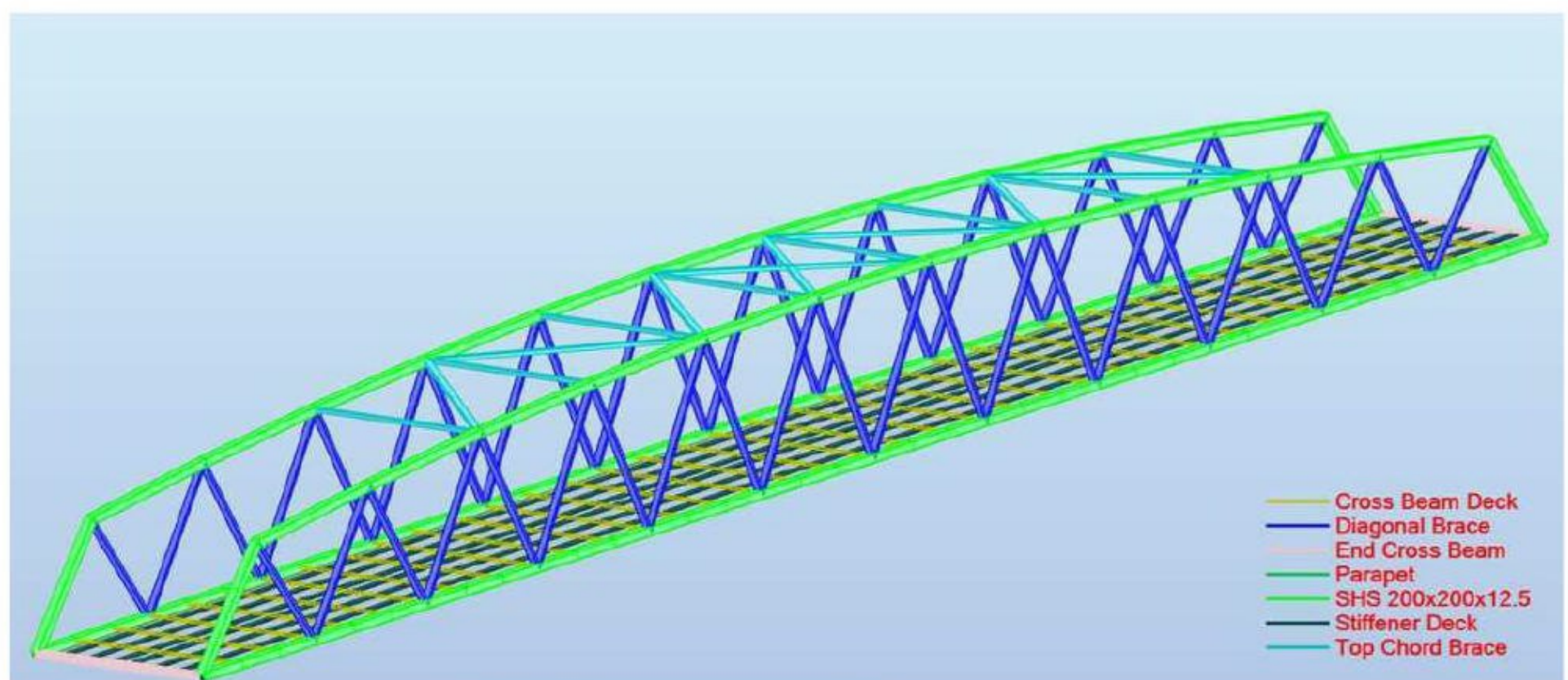


Figure 1 - Idealised Diagram

5.3 **Assumptions intended for calculations of structural element stiffness:**

Section properties for the steelwork will be based on the guidance provided in cl 6.2.2 of BS EN 1993-2.

Gross un-cracked section properties will be used for designing reinforced concrete elements, using short term or long-term values as appropriate.

5.4 Proposed range of soil parameters to be used in the design and assessment of earth retaining elements:

The backfill to the abutments will be class 6N/6P selected granular fill. Initially the characteristic angle of friction will be taken to be 37° for this material.

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:**

A GDR has not yet been completed for the scheme.

6.2 Summary of design for highway structures in Geotechnical Design Report:

A GDR has not yet been completed for the scheme.

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

Initially a differential settlement of up to 25mm between supports will be allowed for.

Detailed design values will be determined in the Geotechnical Design Report.

6.4 If the Geotechnical Design Report is not yet available, state when the results are expected and list the source of information used to justify the preliminary choice of foundations:

A Preliminary Sources Study Report (PSSR) has been conducted in accordance with CD 622 and has been used to inform the preliminary design. There is a broad range of recent ground investigation linked to the proposed housing developments either side of the M80. However, a targeted ground investigation comprising a borehole drilled to rockhead at each abutment location has been completed to verify any assumptions. The ground investigation is currently being analysed and will be used to inform the GDR for the scheme.

Extracts from the PSSR:

Ground conditions are anticipated to comprise a nominal thickness of Topsoil overlying Glacial Till to circa 15m below ground level and the Passage Formation. The Glacial Till has typically been described as stiff to very stiff Clay.

Underground mining has been undertaken at significant depth and are therefore not interpreted to impact the proposed scheme.

Groundwater is anticipated to be present in localised horizons within the Glacial Till.

Ground conditions are considered to be suitable for spread foundations and therefore negate the need for piling. Reinforced earth embankments have been selected to minimise the embankment footprint.

Preliminary ultimate and serviceability limit state analyses, assuming a maximum total settlement of 25mm, have been undertaken in accordance with the approaches outlined in Annex D and Annex F of BS EN 1997-1 (Eurocode 7) and based on the following variables:

Variable	Value	Derivation / comments
Founding depth (m BGL)	1.00	Assumption
Foundation size (m)	3.00 x 5.00	Assumption
Coefficient of volume compressibility, m_v (m^2/MN)	0.075	Based on material description
Undrained deformation modulus, E_u (MN/m^2)	40	Empirical correlation with c_u
Geological factor, μ_g	0.7	Literature assuming over consolidated clay

The analyses indicate the following design resistances:

- *Ultimate Limit State Combination 1:* 308 kN/m^2
- *Ultimate Limit State Combination 2:* 226 kN/m^2
- *Serviceability Limit State:* 111 kN/m^2

7. **CHECK**

7.1 **Proposed category of structure:**

Category 3 as requested by Transport Scotland.

Design Supervision Level 3.

7.2 **If Category 3, name of proposed Checker.**

Jacobs UK Ltd. as requested by Transport Scotland.

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

Construction works are to take place outside of the Highway boundary and will be a suitable distance away from both the carriageway and public interaction.

The bridge will be lifted into position from off the carriageway during a full overnight closure.

8. DRAWINGS AND DOCUMENTS

8.1 List of drawings (including numbers) and documents accompanying the submission:

Appendix A TAS

Appendix B Design Risk Assessment

Appendix C Drawings: BB1440-0600-001 Rev P02 – Overall GA

BB1440-1800-001 Rev PO3 – Superstructure GA

BB1440-2600-001 Rev 0 – Bridge Transport Access Route

9. THE ABOVE IS SUBMITTED FOR ACCEPTANCE

Signed:



Name:

Stephen Hubbard
Design Team Leader

Engineering Qualifications: Meng Beng (Hons) CEng MICE

Name of Organisation: Beaver Bridges Ltd.

Date: 22/10/2021

Signed:



Name:

Mark Robertson
Check Team Leader

Engineering Qualifications: MEng (Hons) CEng MICE

Name of Organisation: Jacobs

Date: 26/10/2021

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

Signed:



Name:

Cameron B Gair

Position held:

Head of Major Bridges & Bridges Asset Management

Name of Organisation: Transport Scotland (Technical Approval Authority)

Date: 29/10/21

APPENDIX A**Technical Approval Schedule (TAS)****Schedule of Documents Relating to Design of Highway Bridges and Structures**

(All documents are taken to include revisions current as of 13 January 2021)

Eurocodes and associated UK National Annexes			
Eurocode part	Title	Amendment / Corrigenda	Notes
Eurocode 0	Basis of structural design		
BS EN 1990:2002 +A1:2005	Eurocode 0: Basis of structural design	+A1:2005 Incorporating corrigenda December 2008 and April 2010	See CD 350 section 7 for additional guidance.
NA to BS EN 1990:2002 + A1:2005	UK National Annex to Eurocode 0 Basis of structural design	National Amendment No.1	See CD 350 section 7 for additional guidance.
Eurocode 1	Actions on structures		
BS EN 1991-1-1:2002	Eurocode 1: Actions on structures. General Actions. Densities, self-weight, imposed load for buildings	Corrigenda December 2004 and March 2009	
NA to BS EN 1991-1-1:2002	UK National Annex to Eurocode 1: Actions on structures. General Actions. Densities, self-weight, imposed load for buildings	Corrigenda July 2019	
BS EN 1991-1-3:2003 +A1:2015	Eurocode 1: Actions on structures. General Actions. Snow loads	+A1:2015 Incorporating corrigenda December 2004 and March 2009	
NA + A2:18 to BS EN 1991-1- 3:2003+A1:2015	UK National Annex to Eurocode 1: Actions on structures. General Actions. Snow loads	+A2:2018 Incorporating corrigenda June 2007, December 2015 and October 2018	

Eurocodes and associated UK National Annexes			
Eurocode part	Title	Amendment / Corrigenda	Notes
BS EN 1991-1-4:2005 +A1:2010	Eurocode 1: Actions on structures. General Actions. Wind actions	+A1:2010 Corrigenda July 2009 and January 2010	
NA to BS EN 1991-1-4:2005 + A1:2010	UK National Annex to Eurocode 1: Actions on structures. General Actions. Wind actions	National Amendment No.1	
BS EN 1991-1-5:2003	Eurocode 1: Actions on structures. General Actions. Thermal actions	Corrigenda December 2004 and March 2009	
NA to BS EN 1991-1-5:2003	UK National Annex to Eurocode 1: Actions on structures. General Actions. Thermal actions	-	
BS EN 1991-1-6:2005	Eurocode 1: Actions on structures. General Actions. Actions during execution	Corrigenda July 2008, November 2012 and February 2013	
NA to BS EN 1991-1-6:2005	UK National Annex to Eurocode 1: Actions on structures. General Actions. Actions during execution	-	
BS EN 1991-1-7:2006 +A1:2014	Eurocode 1: Actions on structures. General Actions. Accidental actions	+A1: 2014 Corrigendum February 2010	
NA+A1 to BS EN 1991-1- 7:2006+A1:2014	UK National Annex to Eurocode 1: Actions on structures. Part 1-7 : Accidental actions	+A1:2014 Incorporating corrigenda August 2014 and November 2015	See CD 350 for additional guidance.
BS EN 1991-2:2003	Eurocode 1: Actions on structures. Traffic loads on bridges	Corrigenda December 2004 and February 2010	See CD 350 section 7 for additional guidance.
NA +A1:2020 to BS EN 1991-2:2003	UK National Annex to Eurocode 1: Actions on structures. Traffic loads on bridges	Corrigendum No.1 Amendment June 2020	See CD 350 section 7 for additional guidance.

Eurocodes and associated UK National Annexes			
Eurocode part	Title	Amendment / Corrigenda	Notes
Eurocode 2	Design of concrete structures		
BS EN 1992-1-1:2004 + A1:2014	Eurocode 2: Design of concrete structures – Part 1-1: General rules and rules for buildings	Incorporating corrigendum January 2008, November 2010 and January 2014	
NA + A2:2014 to BS EN 1992-1-1:2004 + A1:2014	UK National Annex to Eurocode 2: Design of concrete structures – Part 1-1: General rules and rules for buildings		
BS EN 1992-2:2005	Eurocode 2: Design of concrete structures – Part 2: Concrete bridges – Design and detailing rules	Corrigendum July 2008	
NA to BS EN 1992-2:2005	UK National Annex to Eurocode 2: Design of concrete structure – Part 2: Concrete bridges – Design and detailing rules	-	
BS EN 1992-3:2006	Eurocode 2: Design of concrete structures – Part 3: Liquid retaining and containment structures	-	
NA to BS EN 1992-3:2006	UK National Annex to Eurocode 2: Design of concrete structures – Part 3: Liquid retaining and containment structures	-	
BS EN 1992-4:2018	Eurocode 2: Design of concrete structures – Part 4: Design of fastenings for use in concrete		
NA to BS EN 1992-4:2018	UK National Annex to Eurocode 2: Design of concrete structures – Part 4: Design of fastenings for use in concrete		
Eurocode 3	Design of steel structures		
BS EN 1993-1-1:2005 + A1:2014	Eurocode 3: Design of steel structures – Part 1-1 General rules and rules for buildings	Corrigenda February 2006 and April 2009	

Eurocodes and associated UK National Annexes			
Eurocode part	Title	Amendment / Corrigenda	Notes
NA + A1:2014 to BS EN 1993-1-1:2005 + A1:2014	UK National Annex to Eurocode 3: Design of steel structures – Part 1-1 General rules and rules for buildings	-	
BS EN 1993-1-3:2006	Eurocode 3: Design of steel structures – Part 1-3 General rules – Supplementary rules for cold-formed members and sheeting	Corrigendum November 2009	
NA to BS EN 1993-1-3:2006	UK National Annex to Eurocode 3: Design of steel structures – Part 1-3 Supplementary rules for cold-formed members and sheeting	-	
BS EN 1993-1-4:2006 + A1:2015	Eurocode 3: Design of steel structures – Part 1-4 General rules – Supplementary rules for stainless steels	+ A1:2015 Amendment No. 1	
NA+A1:15 to BS EN 1993-1-4:2006+A1:2015	UK National Annex to Eurocode 3: Design of steel structures – Part 1-4 Supplementary rules for stainless steels	+ A1:2015 Amendment No. 1	
BS EN 1993-1-5:2006+A2:2019	Eurocode 3: Design of steel structures – Part 1-5 Plated structural elements	Corrigendum April 2009, +A1:2017 Amendment No. 2, +A2:2019	
NA+A1:2016 to BS EN 1993-1-5:2006	UK National Annex to Eurocode 3: Design of steel structures – Part 1-5 Plated structural elements	+ A1:2016 Amendment No. 1	
BS EN 1993-1-6:2007+ A1:2017	Eurocode 3: Design of steel structures – Part 1-6 Strength and stability of shell structures	+ A1:2017 Amendment No. 1	
BS EN 1993-1-7:2007	Eurocode 3: Design of steel structures – Part 1-7 Plated structures subject to out of plane loading	Corrigendum April 2009	
BS EN 1993-1-8:2005	Eurocode 3: Design of steel structures – Part 1-8 Design of joints	Corrigenda December 2005, September 2006, July 2009 and August 2010	

Eurocodes and associated UK National Annexes			
Eurocode part	Title	Amendment / Corrigenda	Notes
NA to BS EN 1993-1-8:2005	UK National Annex to Eurocode 3: Design of steel structures – Part 1-8 Design of joints	-	
BS EN 1993-1-9:2005	Eurocode 3: Design of steel structures – Part 1-9 Fatigue	Corrigenda December 2005, September 2006 and April 2009	
NA to BS EN 1993-1-9:2005	UK National Annex to Eurocode 3: Design of steel structures – Part 1-9 Fatigue	-	
BS EN 1993-1-10:2005	Eurocode 3: Design of steel structures – Part 1-10 Material toughness and through-thickness properties	Corrigenda December 2005, September 2006 and March 2009	
NA to BS EN 1993-1-10:2005	UK National Annex to Eurocode 3: Design of steel structures – Part 1-10 Material toughness and through thickness properties	-	
BS EN 1993-1-11:2006	Eurocode 3: Design of steel structures – Part 1-11 Design of structures with tension components	Corrigendum April 2009	
NA to BS EN 1993-1-11:2006	UK National Annex to Eurocode 3: Design of steel structures – Part 1-11 Design of structures with tension components	-	
BS EN 1993-1-12:2007	Eurocode 3: Design of steel structures – Part 1-12 Additional rules for the extension of EN 1993 up to steel grades S 700	Corrigendum April 2009	
NA to BS EN 1993-1-12:2007	UK National Annex to Eurocode 3: Design of steel structures – Part 1-12 Additional rules for the extension of EN 1993 up to steel grades S 700	-	
BS EN 1993-2:2006	Eurocode 3: Design of steel structures – Part 2 Steel bridges	Corrigendum July 2009	
NA + A1:2012 to BS EN 1993-2:2006	UK National Annex to Eurocode 3: Design of steel structures – Part 2 Steel bridges	+ A1:2012	

Eurocodes and associated UK National Annexes			
Eurocode part	Title	Amendment / Corrigenda	Notes
BS EN 1993-5:2007	Eurocode 3: Design of steel structures — Part 5 Piling	Corrigendum May 2009	
NA + A1:2012 to BS EN 1993-5:2007	UK National Annex to Eurocode 3: Design of steel structures — Part 5 Piling	+ A1:2012	
Eurocode 4	Design of composite steel and concrete structures		
BS EN 1994-1-1:2004	Eurocode 4: Design of composite steel and concrete structures — Part 1-1 General rules and rules for buildings	Corrigendum April 2009	
NA to BS EN 1994-1-1:2004	UK National Annex to Eurocode 4: Design of composite steel and concrete structures — Part 1-1 General rules and rules for buildings	-	
BS EN 1994-2:2005	Eurocode 4: Design of composite steel and concrete structures — Part 2 General rules and rules for bridges	Corrigendum July 2008	
NA to BS EN 1994-2:2005	UK National Annex to Eurocode 4: Design of composite steel and concrete structures — Part 2 General rules and rules for bridges	-	
Eurocode 5	Design of timber structures		
BS EN 1995-1-1:2004 + A2:2014	Eurocode 5: Design of timber structures — Part 1-1 General — common rules and rules for buildings	+ A2:2014 Incorporating corrigendum June 2006	
NA to BS EN 1995-1-1:2004 + A2:2014	UK National Annex to Eurocode 5: Design of timber structures — Part 1-1 General — common rules and rules for buildings	+ A2:2014	

Eurocodes and associated UK National Annexes			
Eurocode part	Title	Amendment / Corrigenda	Notes
BS EN 1995-2:2004	Eurocode 5: Design of timber structures — Part 2 Bridges	-	
NA to BS EN 1995-2:2004	UK National Annex to Eurocode 5: Design of timber structures — Part 2 Bridges	-	
Eurocode 6	Design of masonry structures		
BS EN 1996-1- 1:2005+A1:2012	Eurocode 6: Design of masonry structures — Part 1-1 General rules for reinforced and unreinforced masonry structures	+A1:2012 Corrigenda February 2006 and July 2009	
NA to BS EN 1996-1-1:2005 +A1:2012	UK National Annex to Eurocode 6: Design of masonry structures — Part 1- 1 General rules for reinforced and unreinforced masonry structures	+A1:2012	
BS EN 1996-2:2006	Eurocode 6: Design of masonry structures — Part 2 Design considerations, selection of materials and execution of masonry	Corrigendum September 2009	
NA to BS EN 1996-2:2006	UK National Annex to Eurocode 6: Design of masonry structures — Part 2 Design considerations, selection of materials and execution of masonry	Corrigendum No.1	
BS EN 1996-3:2006	Eurocode 6: Design of masonry structures — Part 3 Simplified calculation methods for unreinforced masonry structures	Corrigendum October 2009	
NA +A1:2014 to BS EN 1996- 3:2006	UK National Annex to Eurocode 6: Design of masonry structures — Part 3 Simplified calculation methods for unreinforced masonry structures	+A1:2014	
Eurocode 7	Geotechnical design		
BS EN 1997-1:2004+A1:2013	Eurocode 7: Geotechnical design – Part 1 General rules	+A1:2013 Corrigendum February 2009	

Eurocodes and associated UK National Annexes			
Eurocode part	Title	Amendment / Corrigenda	Notes
NA+A1:2014 to BS EN 1997-1:2004+A1:2013	UK National Annex to Eurocode 7: Geotechnical design – Part 1 General rules	+A1:2013 Incorporating Corrigendum No.1	
BS EN 1997-2:2007	Eurocode 7: Geotechnical design – Part 2 Ground investigation and testing	Corrigendum June 2010	
NA to BS EN 1997-2:2007	UK National Annex to Eurocode 7: Geotechnical design – Part 2 Ground investigation and testing	-	
Eurocode 8	Design of structures for earthquake resistance		
BS EN 1998-1:2004 + A1:2013	Eurocode 8: Design of structures for earthquake resistance—Part 1 General rules, seismic actions and rules for buildings	Corrigendum June 2009, January 2011 and March 2013	
NA to BS EN 1998-1:2004	UK National Annex to Eurocode 8: Design of structures for earthquake resistance—Part 1 General rules, seismic actions and rules for buildings	-	
BS EN 1998-2:2005+A2:2011	Eurocode 8: Design of structures for earthquake resistance—Part 2 Bridges	Corrigenda February 2010 and February 2012	
NA to BS EN 1998-2:2005	UK National Annex to Eurocode 8: Design of structures for earthquake resistance—Part 2 Bridges	-	
BS EN 1998-5:2004	Eurocode 8: Design of structures for earthquake resistance—Part 5 Foundations, retaining structures and geotechnical aspects	-	
NA to BS EN 1998-5:2004	UK National Annex to Eurocode 8: Design of structures for earthquake resistance—Part 5 Foundations, retaining structures and geotechnical aspects	-	
Eurocode 9	Design of aluminium structures		

Eurocodes and associated UK National Annexes			
Eurocode part	Title	Amendment / Corrigenda	Notes
BS EN 1999-1-1:2007 + A2:2013	Eurocode 9: Design of aluminium structures—Part 1-1 General structural rules	+ A2:2013 Incorporating corrigendum March 2014	
NA to BS EN 1999-1-1:2007 + A1:2009	UK National Annex to Eurocode 9: Design of aluminium structures—Part 1-1 General structural rules	National Amendment No.1 Corrigendum No.1	
BS EN 1999-1-3:2007 + A1:2011	Eurocode 9: Design of aluminium structures—Part 1-3 Structures susceptible to fatigue	+ A1:2011	
NA to BS EN 1999-1-3:2007 + A1:2011	UK National Annex to Eurocode 9: Design of aluminium structures—Part 1-3 Structures susceptible to fatigue	+ A1:2011	
BS EN 1999-1-4:2007 +A1:2011	Eurocode 9: Design of aluminium structures—Part 1-4 Cold formed structural sheeting	+ A1:2011 Corrigendum November 2009	
NA to BS EN 1999-1-4:2007	UK National Annex to Eurocode 9: Design of aluminium structures—Part 1-4 Cold formed structural sheeting	-	
Bsi Published Documents			
<i>For guidance only unless clauses are otherwise specified in CD 350 Appendix A.</i>			
Published Document reference	Title	Notes	
PD 6687-1:2020	Background paper to the UK National Annexes to BS EN 1992-1 and BS EN 1992-3	<p>Supersedes PD 6687-1:2010</p> <p>See CD 350 clauses 3.6, 4.1, 4.2 and Appendix A for additional guidance.</p> <p>Clause 3.6 in CD 350 refers to clause 2.5 in PD 6687-1, this is now clause 4.5 in PD 6687-1</p> <p>Clause 4.2 in CD 350 refers to clause 2.22 in PD 6687-1, this is now clause 4.21.4 in PD 6687-1</p>	

Eurocodes and associated UK National Annexes			
Eurocode part	Title	Amendment / Corrigenda	Notes
PD 6687-2:2008	Recommendations for the design of structures to BS EN 1992-2:2005	See CD 350 clauses 4.1, 4.2 and Appendix A for additional guidance.	
PD 6688-1-1:2011	Recommendations for the design of structures to BS EN 1991-1-1	See CD 350 Appendix A for additional guidance.	
PD 6688-1-4:2015	Background paper to the UK National Annex to BS EN 1991-1-4	See CD 350 Appendix A for additional guidance.	
PD 6688-1-7:2009 +A1:2014	Recommendations for the design of structures to BS EN 1991-1-7	See CD350 clause 3.7 and Appendix B for additional guidance.	
PD 6688-2:2011	Recommendations for the design of structures to BS EN 1991-2	See CD 350 Appendix A for additional guidance.	
PD 6694-1:2011 + A1:2020	Recommendations for the design of structures subject to traffic loading to BS EN 1997-1	See CD 350 Appendix A for additional guidance.	Amended 27 May 2020 (Temporarily withdrawn due to technical errors)
PD 6695-1-9:2008	Recommendations for the design of structures to BS EN 1993-1-9	See CD 350 Appendix A for additional guidance.	
PD 6695-1-10:2009	Recommendations for the design of structures to BS EN 1993-1-10	See CD 350 Appendix A for additional guidance.	
PD 6695-2:2008 + A1:2012 Incorporating Corrigendum No.1	Recommendation for the design of bridges to BS EN 1993	See CD 350 Appendix A for additional guidance.	
PD 6696-2:2007 + A1:2012	Background paper to BS EN 1994-2 and the UK National Annex to BS EN 1994-2	See CD 350 Appendix A for additional guidance.	
PD 6698:2009	Recommendations for the design of structures for earthquake resistance to BS EN 1998	See CD 350 section 7 for additional guidance.	
PD 6702-1:2009+A1:2019	Structural use of aluminium. Recommendations for the design of aluminium structures to BS EN 1999	Amended 31 May 2019	

Eurocodes and associated UK National Annexes

Eurocode part	Title	Amendment / Corrigenda	Notes
PD 6703:2009	Structural bearings – Guidance on the use of structural bearings		
PD 6705-2:2020	Structural use of steel and aluminium. Execution of steel bridges conforming to BS EN 1090-2. Guide	Replaces PD 6705-2:2010 + A1:2013	
PD 6705-3:2009	Recommendations on the execution of aluminium structures to BS EN 1090-3		

Execution Standards referenced in British Standards or Eurocodes

Execution Standard reference	Title	Notes
BS EN 1090-1:2009+A1:2011	Execution of steel structures and aluminium structures - Part 1: Requirements for conformity assessment of structural components	
BS EN 1090-2:2018	Execution of steel structures and aluminium structures. Technical requirements for the execution of steel structures	Supersedes BS EN 1090-2:2008+A1:2011
BS EN 1090-3:2019	Execution of steel structures and aluminium structures – Part 3: Technical requirements for aluminium structures	Supersedes BS EN 1090-3:2008
BS EN 13670:2009 Incorporating corrigenda October 2015 and November 2015	Execution of concrete structures	

Product Standards referenced in British Standards or Eurocodes		
Product Standard reference	Title	Notes
BS EN 206:2013+A1:2016	Concrete – Specification, performance, production and conformity	+A1:2016
BS EN 1317-1:2010	Road Restraint Systems – Part 1 – Terminology and general criteria for test methods	
BS EN 1317-2:2010	Road Restraint Systems – Part 2 – Performance classes, impact test acceptance criteria and test methods for safety barriers.	
BS EN 1317-3:2010	Road Restraint Systems – Part 3 – Performance classes, impact test acceptance criteria and test methods for crash cushions.	
DD ENV 1317-4:2002	Road Restraint Systems – Part 4 – Performance classes, impact test acceptance criteria and test methods for terminals and transitions of safety barriers.	<i>Draft BS EN 1317-4 for public comment published in June 2012</i>
BS EN 1317-5:2007+A2:2012	Road Restraint Systems – Part 5 – Product requirements and evaluation of conformity for vehicle restraint systems	Incorporating corrigendum August 2012 <i>Draft prEN 1317-5 for public comment published in December 2013</i>
PD CEN/TR 16949:2016	Road Restraint System – Pedestrian restraint system – Pedestrian parapets	<i>Bsi Published Document / GEN Technical Report published in July 2016</i> <i>(This document should not be used. The requirements of BS 7818:1995 apply.)</i>
Draft prEN 1317-7	Road restraint systems – Part 7: Performance classes, impact test acceptance criteria and test methods for terminals of safety barriers	<i>Draft prEN 1317-7 for public comment published in June 2012</i> <i>(This document should not be used. All terminals should continue to be in accordance with ENV1317-4.)</i>
PD CEN/TS 17342:2019	Road restraint systems – Motorcycle road restraint systems which reduce the impact severity of motorcycle collisions with safety barriers	<i>Replaces PD CEN/TS 1317-8:2012</i> <i>(This document should not be used.)</i>
PD CEN/TR 17081:2018	Design of fastenings for use in concrete – Plastic design of fastenings with headed and post-installed fasteners	
BS EN 1337-1:2000	Structural bearings – Part 1: General Design Rules	
BS EN 1337-2:2004	Structural bearings – Part 2: Sliding elements	
BS EN 1337-3:2005	Structural bearings – Part 3: Elastomeric bearings	
BS EN 1337-4:2004	Structural bearings – Part 4: Roller bearings	Corrigendum No.1 March 2007
BS EN 1337-5:2005	Structural bearings – Part 5: Pot bearings	
BS EN 1337-6:2004	Structural bearings – Part 6: Rocker bearings	

Product Standards referenced in British Standards or Eurocodes		
Product Standard reference	Title	Notes
BS EN 1337-7:2004	Structural bearings – Part 7: Spherical and cylindrical PTFE bearings	
BS EN 1337-8:2007	Structural bearings – Part 8: Guide bearings and restraint bearings	
BS EN 1337-9:1998	Structural bearings – Part 9: Protection	
BS EN 1337-10:2003	Structural bearings – Part 10: Inspection and maintenance	Corrigendum No.1 November 2003
BS EN 1337-11:1998	Structural bearings – Part 11: Transport, Storage and Installation.	
BS EN 10025-1:2004	Hot rolled products of structural steels Part 1: General technical delivery conditions.	
BS EN 10025-2:2019	Hot rolled products of structural steels Part 2: Technical delivery conditions for non-alloy structural steels.	Supersedes BS EN 10025-1:2004
BS EN 10025-3:2019	Hot rolled products of structural steels Part 3: Technical delivery conditions for normalized/normalized rolled weldable fine grain structural steels.	Supersedes BS EN 10025-3:2004
BS EN 10025-4:2019	Hot rolled products of structural steels Part 4: Technical delivery conditions for thermomechanical rolled weldable fine grain structural steels.	Supersedes BS EN 10025-4:2004
BS EN 10025-5:2019	Hot rolled products of structural steels – Part 5: Technical delivery conditions for structural steels with improved atmospheric corrosion resistance	Supersedes BS EN 10025-5:2004
BS EN 10025-6:2019	Hot rolled products of structural steels – Part 6: Technical delivery conditions for flat products of high yield strength structural steels in the quenched and tempered condition.	Supersedes BS EN 10025-6:2004+A1:2009
BS EN 10080:2005	Steel for the reinforcement of concrete – Weldable reinforcing steel - General	
BS EN 10210-1:2006	Hot finished structural hollow sections of non-alloy and fine grain steels – Part 1: Technical delivery conditions	
BS EN 10210-2:2019	Hot finished structural hollow sections – Part 2: Tolerances, dimensions and sectional properties	Supersedes BS EN 10210-2:2006
BS EN 10248-1:1996	Hot rolled sheet piling of non alloy steels. Technical delivery conditions	
BS EN 10248-2:1996	Hot rolled sheet piling of non alloy steels. Tolerances on shape and dimensions	
BS EN 12063:1999	Execution of special geotechnical work. Sheet pile walls.	
BS EN 14388:2005	Road traffic noise reducing devices	There is a 2015 version, however the 2015 version is not harmonised.
BS EN 15050:2007 + A1:2012	Precast concrete products – Bridge elements	See CD 350 clause 3.8.1 for additional guidance.

British Standards		
British Standard reference	Title	Notes
BS 4449:2005+A3:2016	Steel for the reinforcement of concrete	No longer covers plain round bar. (See BS4482 up to 12mm dia, see BS EN 10025-1 for larger sizes and dowels. See BS EN 13877-3 for dowel bars in concrete pavements.)
BS 5896:2012	Specification for high tensile steel wire and strand for the prestressing of concrete	
BS 7818:1995	Specification for pedestrian restraint systems in metal	Incorporating Corrigendum No.1 May 2004 and Corrigendum No.2 September 2006 Currently the requirements of BS 7818:1995 are to be used instead of PD CEN/TR 16949:2016
BS 8002:2015	Code of practice for earth retaining structures	
BS 8004:2015 +A1 2020	Code of practice for foundations	Amendment +A1:2020
BS 8006-1:2010+A1:2016	Code of practice for strengthened/reinforced soils and other fills	
BS 8500-1:2015+A2:2019	Concrete – Complementary British Standard to BS EN 206: Method of specifying and guidance for the specifier.	Incorporating Corrigendum No.1 and Corrigendum No.2 June 2020 Amendment +A2:2019
BS 8500-2:2015+A2:2019	Concrete – Complementary British Standard to BS EN 206 : Specification for constituent materials and concrete.	Amendment +A2:2019
BS 8666:2020	Scheduling, dimensioning, bending and cutting of steel reinforcement for concrete	Supersedes BS 8666:2005

The Manual Contract Document for Highway Works (MCHW)		
MCHW reference	Title	Notes
MCHW Volume 1: March 2020	Specification for Highway Works	<i>Specification compliant with the execution standards must be used. A Departure is necessary for the parts where a compliant revision has not been published. Amendments March 2020</i>
MCHW Volume 2: March 2020	Notes for guidance on the Specification for Highway Works	<i>Notes for guidance compliant with the execution standards must be used. A Departure is necessary for the parts where a compliant revision has not been published. Amendments March 2020</i>
MCHW Volume 3: February 2017	Highway Construction Details	

The Design Manual for Roads and Bridges (DMRB)

DMRB reference	Title	Notes
GG 101 Revision 0	Introduction to the Design Manual for Roads and Bridges	Replaces GD 01/16
GG 102 Revision 0	Quality Management Systems for Highway Design	Replaces GD 02/16
GG 103 Revision 0	Introduction and general requirements for sustainable development and design	
GG 104 Revision 0	Requirements for Safety Risk Assessment	Replaces GD04/12 and IAN 191/16
GG 184	Specification for the use of Computer Aided Design	Replaces IAN 184/16
CG 300 Revision 0	Technical approval of highway structures	Supersedes BD 2/12
CG 302 Revision 0	As-built, operational and maintenance records for highway structures	Supersedes BD 62/07
CG 303 Revision 0	Quality assurance scheme for paints and similar protective coatings	Supersedes BD 35/14
CG 305 Revision 0	Identification marking of highway structures	Supersedes BD 45/93
CG 501 Revision 2	Design of highway drainage systems	Supersedes HD 33/16, TA 80/99
CD 127 Revision 1	Cross-sections and headrooms	Replaces TD 27/05 and TD 70/08
CD 350 Revision 0	The design of highway structures	Supersedes BD 100/16, BA 57/01, BD 57/01 and IAN 124/11
CD 351 Revision 0	The design and appearance of highway structures	Supersedes BA 41/98
CD 352 Revision 0	Design of road tunnels	Supersedes BD 78/99
CD 353 Revision 0	Design criteria for footbridges	Supersedes BD 29/17
CD 354 Revision 1	Design of minor structures	Supersedes BD 94/17
CD 355 Revision 0	Application of whole-life costs for design and maintenance of highway structures	Replaces BD 36/92 and BA 28/92
CD 356 Revision 1	Design of highway structures for hydraulic action	Supersedes BA 59/94
CD 357 Revision 1	Bridge expansion joints	Replaces BD 33/94, BA 26/94, IAN 168/12 and IAN 169/12
CD 358 Revision 1	Waterproofing and surfacing of concrete bridge decks	Replaces BD 47/99, BA 47/99 and IAN 96/07
CD 359 Revision 0	Design requirements for permanent soffit formwork	Supersedes BA 36/90 and IAN 131/11
CD 361 Revision 0	Weathering steel for highway structures	Supersedes BD 7/01
CD 362 Revision 1	Enclosure of bridges	Replaces BD 67/96 and BA 67/96
CD 363 Revision 0	Design rules for aerodynamic effects on bridges	Replaces BD 49/01
CD 364 Revision 0	Formation of continuity joints in bridge decks	Replaces BA 82/00
CD 365 Revision 1	Portal and cantilever signs/signals gantries	Replaces BD 51/14, IAN 193/16, BE 7/04
CD 366 Revision 0	Design criteria for collision protection beams	Replaces BD 65/14
CD 368 Revision 0	Design of fibre reinforced polymer bridges and highway structures	Replaces BD 90/05
CD 369 Revision 0	Surface protection for concrete highway structures	Replaces BA 85/04

The Design Manual for Roads and Bridges (DMRB)

DMRB reference	Title	Notes
CD 372 Revision 0	Design of post-installed anchors and reinforcing bar connections in concrete	Supersedes IAN 104/15
CD 373 Revision 0	Impregnation of reinforced and prestressed concrete highway structures using hydrophobic pore-lining impregnants	Supersedes BD 43/03
CD 374 Revision 0	The use of recycled aggregates in structural concrete	Supersedes BA 92/07
CD 375 Revision 1	Design of corrugated steel buried structures	Supersedes BD 12/04
CD 377 Revision 3	Requirements for road restraint systems	Supersedes TD 19/06
CD 622 Revision 1	Managing geotechnical risk	Replaces HD 22/08, BD 10/97 and HA 120/08
GS 464 Revision 0	Assessment and upgrading of in-service parapets	Supersedes BA 37/92 and IAN 97/07
GD 304 Revision 2	Designing health and safety into maintenance	Replaces IAN 69/15
LA 104 Revision 1	Environmental assessment and monitoring	Supersedes HA 205/08, HD 48/08, IAN 125/15, and IAN 133/10
LA 106 Revision 1	Cultural heritage assessment	Supersedes HA 208/07, HA 60/92, HA 75/01
LA 110 Revision 0	Material assets and waste	Supersedes IAN 153/11
LA 113 Revision 1	Road drainage and the water environment	Supersedes HD 45/09
LD 119 Revision 0	Roadside environmental mitigation and enhancement	Formerly LA 119, which superseded HA 65/94 and HA 66/95

Interim Advice Notes

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

Miscellaneous

Standard reference	Title	Notes
CIRIA C543	Bridge Detailing Guide	
CIRIA C766	Control of cracking caused by restrained deformation in concrete	Supersedes C660
CIRIA C686	Safe Access for Maintenance and Repair	
CIRIA C760	Guidance on embedded retaining wall design	

Additional Standards

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

Reference	Title	Notes
TSIA 27	Interim Advice Notes IAN 105/08 Implementation of Construction (Design and Management)	Replaces SD 10/05 and SD 11/05
TSIA 23	Interim Advice Note Implementation of BS 8500-1:2006 Concrete	Concrete Grades

APPENDIX B

DESIGN RISK ASSESSMENT

To be read with Drawings ref:

Refer to Appendix C

Design Organisation:

Beaver Bridges Limited

Introduction:

- 1 The action column indicates those items considered by Beaver Bridges Limited. Actions shown as "Others" should be considered by the client, be documented, and any resulting actions must be communicated directly to those it may concern.

Prepared by: Luke Jenkins

Date: 01/02/2020

Signed:



Item Ref.	Item Description & Possible Hazard	Measures to Reduce Risks	Action By
A	<u>PRODUCT MANUFACTURE</u>		
A1	Manufacture Safety of employees and suppliers during manufacturing process.	Work to requirements of Company Health and Safety Policy. Advise Depot/Workshop of any specific considerations relating to bought-in or special items.	BBL BBL
B	<u>SYSTEM WHILST IN USE</u>		
B1	System to safely support applied loads. Consequences of structural collapse or major serviceability problems.	Provide adequate survey drawings of site structures. Ensure that design brief clearly defines loadings or sufficient information is provided to enable loadings to be calculated. Design brief must include position and value of permissible loads that can be transmitted into permanent structure and apportionment of loads between temporary and permanent structure (if appropriate), including the effects of any phased construction.	BBL
B2	Foundations Settlement causing undue loads in structure.	Quantify effects of settlement of foundations.	BBL

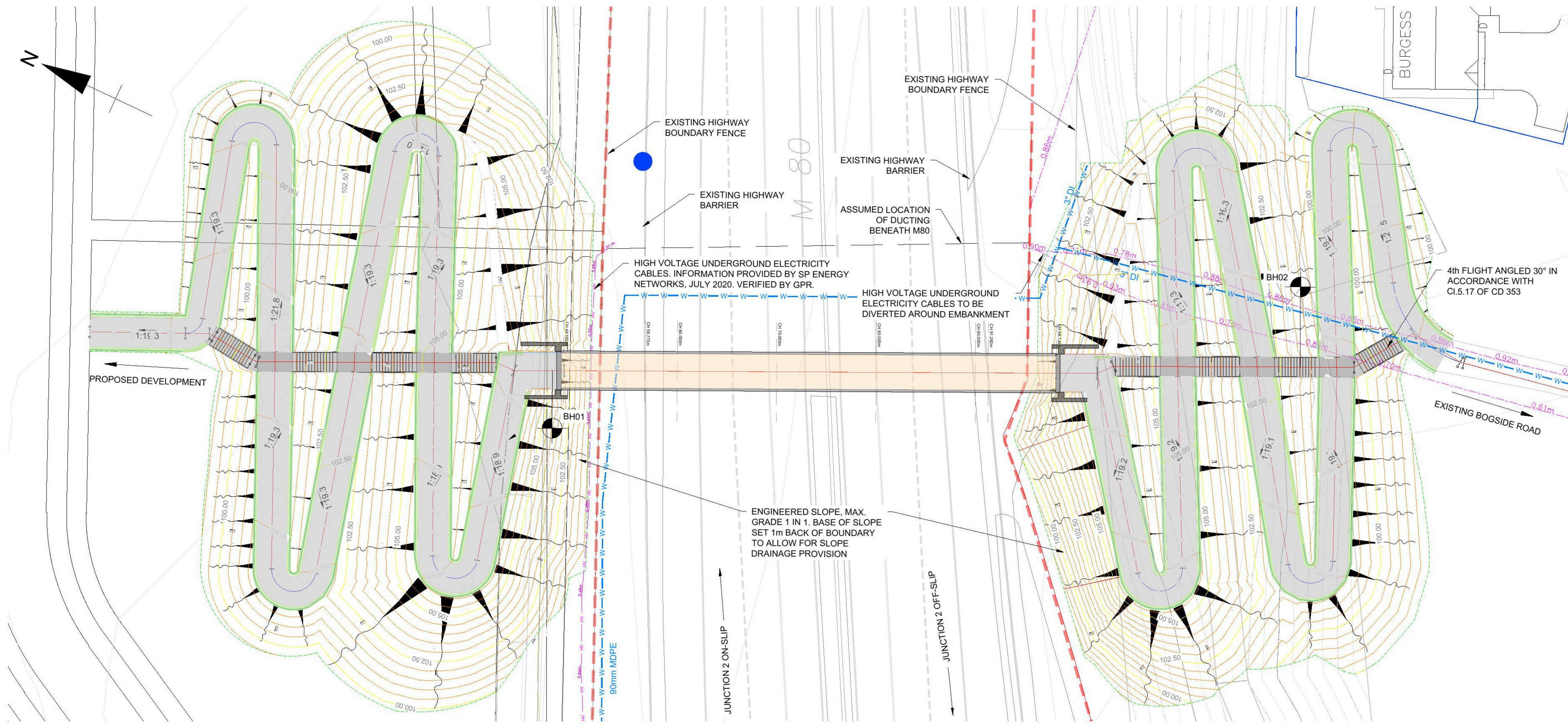
Item Ref.	Item Description & Possible Hazard	Measures to Reduce Risks	Action By
B3	<p>Suitable plan location & level</p> <p>Possible hazards resulting from the site adaptation of support system required avoiding clashes with structure/services.</p>	<p>Provide full drawings of proposed structure.</p> <p>Survey existing assets.</p>	<p>BBL</p> <p>BBL</p>
B4	<p>Services</p> <p>Has sufficient investigation of services taken place to ensure sufficient clearances for the temporary works?</p>	<p>Works information to include location of services.</p>	<p>BBL/ Others</p>
B5	<p>Deck Surface</p> <p>Pedestrians skidding or slipping.</p>	<p>Specify anti-slip surfacing where applicable.</p>	<p>BBL</p>
B6	<p>Pedestrians falling from height.</p> <p>Risks to pedestrians on bridge</p>	<p>Parapet of adequate height provided to both elevations to prevent pedestrians from falling from the bridge.</p> <p>Self-Harm risk to be considered and mitigation measures adopted if required. Glasgow City Council to advise.</p> <p>Consider climb ability of elements and include measures to dissuade.</p>	<p>BBL</p> <p>BBL/ Others</p> <p>BBL</p>
B7	<p>Other Hazards Whilst Structure in Use</p> <p>Adequate protection to any services.</p>	<p>Assess site for any above or below ground services.</p>	<p>BBL/ Others</p>

Item Ref.	Item Description & Possible Hazard	Measures to Reduce Risks	Action By
C	<u>DURING ERECTION / DISMANTLING</u>		
C1	<p>Hazards to erection team and others due to working adjacent to:</p> <p>Services.</p> <p>Highways</p> <p>Demolition / other construction works.</p>	<p>Conduct STATS survey.</p> <p>Relocate conflicting buried services before commencement of works.</p> <p>Liaise with highway authority and arrange closures as required.</p> <p>Lift to be planned by an Appointed Person.</p> <p>Minimise time spent on the network, construct outside of the road boundary where possible.</p> <p>Clearly define BBL's working areas.</p>	<p>BBL</p> <p>BBL</p> <p>BBL/ Others</p> <p>BBL</p> <p>BBL</p> <p>BB/ Others</p>
C2	<p>Temporary loads during erection/dismantling</p> <p>Loadings during erection may be greater than design loads for in-service use.</p> <p>Construction sequence.</p>	<p>Foundation reactions must include additional loads caused by method of erection.</p> <p>Abutments to be designed with consideration to sequencing of works. E.g., Superstructure landed before backfilling and construction of embankments.</p>	<p>BBL</p> <p>BBL</p>
C3	<p>Ground Conditions/foundations</p> <p>Poor ground conditions affecting access, erection and craneage</p>	<p>Adequate access to be provided for vehicles, plant, and labour. Crane pad to be designed by appropriate persons.</p>	<p>BBL</p>

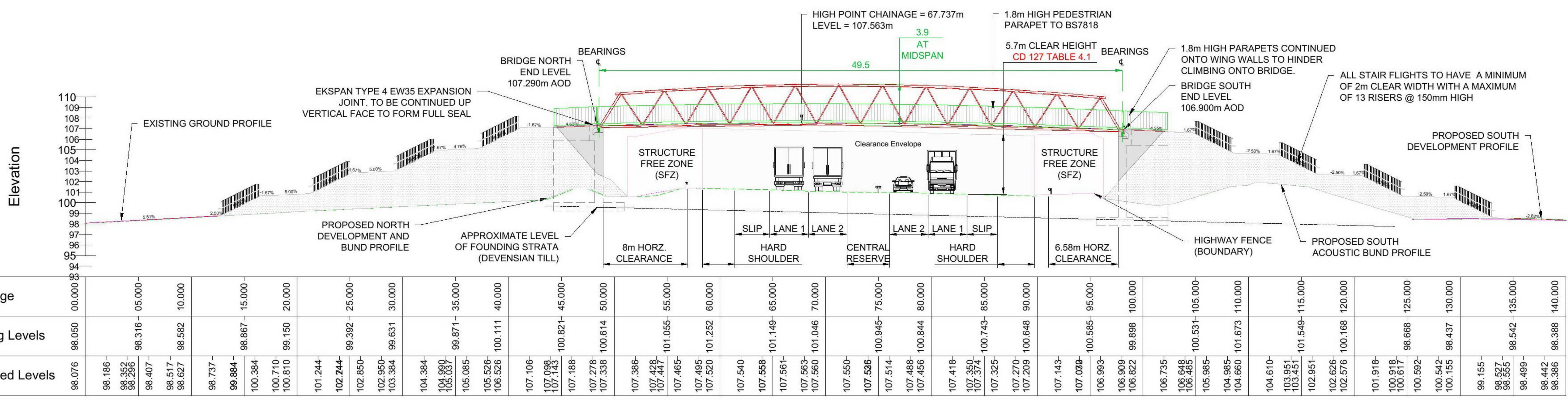
Item Ref.	Item Description & Possible Hazard	Measures to Reduce Risks	Action By
C4	<p>Other hazards during erection & dismantling</p> <p>Hazards associated with steel erection.</p> <p>Construction & Installation.</p>	<p>Apply established safe methods of erection and dismantling on site.</p> <p>Design with suitable lifting points / joints.</p> <p>Apply safe methods on site.</p> <p>Use competent personnel for planning, erection, and dismantling.</p> <p>Use Beaver Bridges Limited QA procedures.</p> <p>Carry out as much pre-assembly on the ground as is reasonably practicable.</p> <p>Others to ensure a suitable, safe, site layout is achievable.</p> <p>All lifting weights to be provided, with lifting positions confirmed. The bridge has been designed to be as light as possible. A suitable lifting plan is to be provided.</p> <p>Check if reinforcement is self-supporting or provide temporary propping as required.</p>	<p>BBL</p> <p>BBL</p> <p>BBL</p> <p>BBL</p> <p>BBL</p> <p>BBL</p> <p>Others</p> <p>BBL</p> <p>BBL</p>
C5	<p>Setting-out Tolerances</p> <p>Foundation uneven.</p> <p>Setting-out on foundations incorrect.</p> <p>Bearings incorrectly located causing eccentricity.</p>	<p>Ensure construction is within tolerances.</p> <p>Ensure all lines and levels are within tolerance.</p> <p>Ensure bearings are positioned within tolerance.</p>	<p>BBL</p> <p>BBL</p> <p>BBL</p>
C6	<p>Interaction with the public</p> <p>Minimise interaction with, and inconvenience to, the public.</p>	<p>Complete prefabrication of superstructure and lift in from off the network during single overnight closure to minimise disruption.</p>	<p>BBL</p>

Item Ref.	Item Description & Possible Hazard	Measures to Reduce Risks	Action By
D	<u>DURING MAINTENANCE</u>		
D1	<p>Hazards associated with gaining access to carry out maintenance.</p> <p>Working at height.</p>	<p>Consider that safe access may be required to the structure for maintenance/inspections.</p>	<p>BBL/ Others</p>

APPENDIX C



PROPOSED APPROACH RAMPS/STAIRS AND BRIDGE LAYOUT
SCALE 1:250



APPROACH AND BRIDGE SECTION PROFILE - LONGSECTION
SCALE: H 1:250, V 1:250. DATUM: 93.000

Chainage	Existing Levels	Proposed Levels
00.000	98.050	98.076
05.000	98.186	98.186
10.000	98.352	98.352
15.000	98.295	98.295
20.000	98.407	98.407
25.000	98.517	98.517
30.000	98.627	98.627
35.000	98.737	98.737
40.000	98.884	98.884
45.000	100.384	100.384
50.000	100.710	100.710
55.000	100.810	100.810
60.000	101.244	101.244
65.000	102.244	102.244
70.000	102.850	102.850
75.000	102.950	102.950
80.000	103.384	103.384
85.000	104.384	104.384
90.000	106.037	106.037
95.000	106.085	106.085
100.000	105.526	105.526
105.000	107.106	107.106
110.000	107.088	107.088
115.000	107.143	107.143
120.000	107.188	107.188
125.000	107.278	107.278
130.000	107.338	107.338
135.000	107.386	107.386
140.000	107.428	107.428
145.000	107.447	107.447
150.000	107.465	107.465
155.000	107.495	107.495
160.000	107.520	107.520
165.000	107.540	107.540
170.000	107.568	107.568
175.000	107.561	107.561
180.000	107.563	107.563
185.000	107.560	107.560
190.000	107.560	107.560
195.000	107.596	107.596
200.000	107.514	107.514
205.000	107.488	107.488
210.000	107.456	107.456
215.000	107.418	107.418
220.000	107.391	107.391
225.000	107.325	107.325
230.000	107.270	107.270
235.000	107.209	107.209
240.000	107.143	107.143
245.000	107.092	107.092
250.000	106.993	106.993
255.000	106.909	106.909
260.000	106.822	106.822
265.000	106.735	106.735
270.000	106.648	106.648
275.000	106.485	106.485
280.000	106.385	106.385
285.000	104.985	104.985
290.000	104.860	104.860
295.000	104.610	104.610
300.000	103.951	103.951
305.000	103.451	103.451
310.000	102.951	102.951
315.000	102.626	102.626
320.000	102.576	102.576
325.000	101.918	101.918
330.000	100.918	100.918
335.000	100.617	100.617
340.000	100.592	100.592
345.000	100.542	100.542
350.000	100.155	100.155
355.000	99.155	99.155
360.000	98.527	98.527
365.000	98.355	98.355
370.000	98.499	98.499
375.000	98.442	98.442
380.000	98.386	98.386
385.000	98.386	98.386

- NOTES**
- ALL DIMENSIONS IN MILLIMETERS. ALL LEVELS IN METERS.
 - THIS DRAWING TO BE READ IN CONJUNCTION WITH OTHER SCHEME DRAWINGS IF APPLICABLE
 - THIS IS A CAD PRODUCED DRAWING AND SHOULD NOT BE AMENDED BY HAND
 - DO NOT SCALE FROM THIS DRAWING. WORK TO STATED DIMENSION ONLY. IF IN DOUBT ASK.
 - TO BE READ IN CONJUNCTION WITH THE AIP DOCUMENT REF. BB1440-AIP-01.
 - FOR BOREHOLE LOGS SEE TO SOILTECHNICS GROUND INVESTIGATION REPORT REF. STS5182-R03 REV B

- KEY:**
- PROPOSED ABUTMENTS
 - PROPOSED RAMP, MAX. GRADE 1 IN 22, MIN. WIDTH 3.0m
 - PROPOSED LANDINGS
 - PROPOSED STEPS, 300mm TREAD, 150mm RISER

CDM NOTES:

CDM NOTES ARE PROVIDED TO ASSIST THE PRINCIPAL CONTRACTOR TO FULFILL THEIR OBLIGATIONS UNDER THE CONSTRUCTION DESIGN & MANAGEMENT REGULATIONS 2015. IT DOES NOT INCLUDE RESIDUAL RISK THAT A COMPETENT CONTRACTOR WILL BE AWARE OF NOR DOES IT ABSOLVE THE PRINCIPAL CONTRACTOR OF HIS LEGAL RESPONSIBILITIES

FOR FURTHER HAZARDS AND RISK INFORMATION, REFER TO PROJECT RISK ASSESSMENT: BB1440 - DRA

- CDM KEY:**
- INDICATES A RESIDUAL RISK REQUIRING A COMPULSORY ACTION
 - CONVEYS INFORMATION ABOUT A RESIDUAL RISK
 - INDICATES A RESIDUAL RISK REQUIRING A SPECIFIC ACTION TO BE AVOIDED
 - WARNS OF A RESIDUAL RISK OR INFORMATION THAT IS UNUSUAL AND CANNOT BE DESIGNED OUT



LOCATION PLAN
SCALE 1:25,000

Rev	Description	Chkd	By	Date
P02	FOOTWAY AMENDED TO 3.0m WIDE, VERGE ADDED	LJ	BS	17/05/21
P01	GPR SURVEY OF NORTH HV CABLE ADDED	LJ	LJ	08/03/21

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Archers Way,
Battlefield Enterprise Park,
Shrewsbury SY1 3GA
Tel: 01743 811 811



Client
PL ROBROYSTON LTD.

Project Name
ROBROYSTON PROPOSED FOOTBRIDGE

Drawing Title
GENERAL ARRANGEMENT

Start Date	Drawn	Designed	Checked	Scale
05/02/2021	BS	BS	LJ	AS SHOWN
Drawing Status FOR APPROVAL				Page Size A1 L
Drawing No BB1440-0600-001				Rev P02