Queensberry
DESIGN LIMITED
RESIDENTIAL AND COMMERCIAL DESIGN CONSULTANTS

Keresforth Road, Barnsley

Road Crossing Design Assessment and Scope

August 2024

Queensberry Design (Yorkshire) Ltd: Brookfield Court, Selby Road, Leeds, LS25 1NB

ISSUE SHEET

Prepared	Date		Checked	Date
ND	16.08.2024		RB	19.08.2024
-	First issue			19.08.2024

This document has been prepared solely for Keepmoat Homes Limited regarding the proposed scheme at Keresforth Road. Queensberry Design Ltd accepts no responsibility or liability for any use that is made of this document other than by the Client for which it was originally commissioned and prepared. The risks identified at the time of writing are an opinion based on information available at the time and may not be exhaustive.

CONTENTS

APPENDICES

1. Introduction

1.1 Queensberry Design has been appointed to produce an assessment and draft design for the proposed watercourse road crossing for the proposed development at Keresforth Road, Barnsley.

1.2 The development is at the master planning stage and outline planning has been submitted to Barnsley Metropolitan Borough Council (BMBC) under reference 2022/0016.

1.3 Queensberry Design Ltd (QDL) carried out a civil engineering appraisal consisting of an assessment of levels, earthworks, and structures which can be viewed in Appendix 3 and 4 of this document.

1.4 The purpose of this assessment is to outline the design process undertaken to reach the current option and to outline further work to be undertaken upon the detailed design.

2. Need for Works

2.1 The masterplan layout and detailed road alignment drawing supplied to QDL propose a new carriageway over the existing watercourse which intersects the site.

2.2 The carriageway's purpose is to provide vehicular and pedestrian access to the northern segment of the application site.

2.3 The road provides access to a large proportion of the proposed dwellings on the application site.

2.4 Without the proposed road crossing the development would not be able to provide a suitable number of dwellings to be viable.

3. Site Constraints

3.1 As per the survey within Appendix 1 the existing watercourse intersecting the site is within the base of a valley which is on average 5.0m deep.

3.2 The watercourse is not an Environment Agency main river and will be under the responsibility of the Lead Local Flood Authority (LLFA). The watercourse is currently culverted at the location of the proposed road crossing and is open channel downstream.

3.3 Site gradients on the approach to the watercourse are steep, and in places up to a gradient of 1 in 7.

3.4 The watercourse and surrounding valley are heavily wooded, consultation with the council through the outline application has established that the loss of woodland and trees, should be kept to the absolute minimum.

3.5 The scheme also falls within the requirements of Biodiversity Net Gain (BNG) meaning the loss of habitat would impact the scheme's legal BNG requirements.

3.6 As drawings in Appendix 2 the redline boundary is close to the road crossing and no works such as earthworks can leave the redline.

3.7 No notable flooding is recorded on the watercourse, any works on the watercourse should not increase/generate a flood risk.

3.8 In accordance with national guidance, culverting of watercourses should be avoided and where possible developments should incorporate de-culverting.

4. Road design and levels

4.1 An initial highway design has been undertaken which can be viewed in Appendix 3.

4.2 The principle of the design is to achieve a design level as low as possible when crossing the watercourse.

4.3 The initial design can lower the road profile, but due to the depth of the watercourse, the scheme cannot achieve a level near the existing watercourse level.

4.4 If the road was lowered more than currently proposed, the vertical alignment would have sleeper than acceptable gradients and the embankments back to existing level along the route would exit the site boundary.

4.5 Based on the constraints a lower carriageway profile to remove the need for carriageway retaining is not feasible.

4.6 Based on the current design the level difference between the proposed footpath level to the watercourse is circa 4.4m.

5. None retainment options

5.1 Given the level difference from the carriageway to watercourse none retainment options have been investigated.

5.2 However, due to the proximity of the redline boundary on the northern side of the carriageway it is not possible to use earthworks to reduce levels.

5.3 Land is available on the southern side of the carriageway to reduce levels by implementing earthworks, however this would lead to tree removal, and increasing the length of watercourse culverting.

5.4 Earthworks could prove to be a regular maintenance issue i.e. vegetation management.

5.5 Additional culverting should be avoided whenever possible.

6. Retaining wall design

6.1 As the application is currently outline and the extent of available information the purpose of this section is to inform design, approval and construction considerations, which shall be brought through to the detailed design.

6.2 Retaining wall systems, such as crib walls, soil reinforcement and gabion baskets have been discounted, due to design life, loadings, and maintenance.

6.3 The use of a cast-in-suit reinforced stem wall would be a deliverable option, however, given the site constraints and the retained height the preferred method of retaining is a faced geo-grid reinforced wall.

6.4 As the road is elevated this system allows staged filling on the road profile and is clearer by reducing the amount of in-situ concrete. The proposed system requires no structural maintenance, maintenance such as removal of dirt build-up, mold and moss growth may be required to exposed faces of the concrete block facing units.

Site Investigation

6.5 Intrusive site investigation is required in the location of the road crossing, the investigation must conclude found ground condition, soil bearing pressures, soil chemical analysis and associated recommendations.

Approval Process

6.6 The proposed structure is classified as a category 1 structure and requires Approval in Principle (AIP) in accordance with DMBR CG 300 – Technical approval for highway structures.

6.7 The AIP and design will require assessment and approval from the Technical Approval Authority (TAA) in this case Barnsley Metropolitan Borough Council.

6.8 The AIP documentation shall detail all aspects of the design including:

Highway Details

- Highway details
  - Type of highway as CD109, permitted traffic speeds
- Site details
  - Locality
  - Constraints/obstacles crossed

Proposed Structure

- Proposed structure
  - Description of structure and working life
  - Type of wall, principle materials
  - Retained height
  - Dimensions for embedment depth/base etc
- Structural type
  - Detailed technical description of the structure, which informs how it is to be modelled
- Foundation type
  - Detailed technical description of the foundation type, which informs how it is to be modelled
- Classes and levels
  - Reinforced soil retaining walls constructed using the proposed system must be designed in accordance with BD 8006-1:2010 and the MCHW, Volume 1
- Road restraint system requirements
- Proposals for water management
- Future maintenance and inspection
- Environment and sustainability
  - Description of features which may improve the sustainability of the structure
- Durability of materials and finishes
  - Detailed description of component materials
- Proposed arrangements for construction

    - Construction of the structure
    - Traffic management
- Resilience and security

Design Criteria

- Actions
    - Permanent actions
    - Snow, wind and thermal actions
    - Actions relating to normal traffic
    - Actions relating to special vehicle type (if necessary)
    - Accidental actions (structural currently not designed/suitable for accidental loading)
    - Action during construction
    - Standards and documents listed in the Technical Approval Schedule

Structural Analysis

- Methods of analysis proposed for the structure, substructure and foundations
- Description and diagram of idealised structure to be used for analysis
    - Describe the geometry, loading criteria and support conditions
- Proposed range of soil parameters to be used in the design of earth retaining elements.
    - Typically to include bearing capacity, angle of friction, lateral earth pressure and any other variable.

Geotechnical Conditions

- Acceptance of the recommendations of the ground investigation report
- Summary of design for highway structure in the geotechnical report
- If the geotechnical report is not available state when results are expected and information used to justify the preliminary choice of foundation

6.9 Once the AIP is approved by the TAA, the design organisation shall provide a signed design check certificate which is to be counter signed by the TAA.

6.10 The scope for the construction sign-off and requirements for inspections and as-built surveys shall be agreed with the TAA, before the commencement of construction works.

6.11 The TAA must be invited to attend site during key construction activities, such as:

- Excavation of formation
- Pouring of concrete
- Placement of initial courses of facing units
- Placement of backfill and geo-grid

6.12 Additionally, the contractor shall provide photographic evidence of construction as directed by the design organisation or TAA.

7. Outline design

7.1 In accordance with the criteria of section 6 an outline design has been progressed for consultation with the TAA – prior to the commencement of site investigation and detailed works, which is expected to commence after the outline planning application.

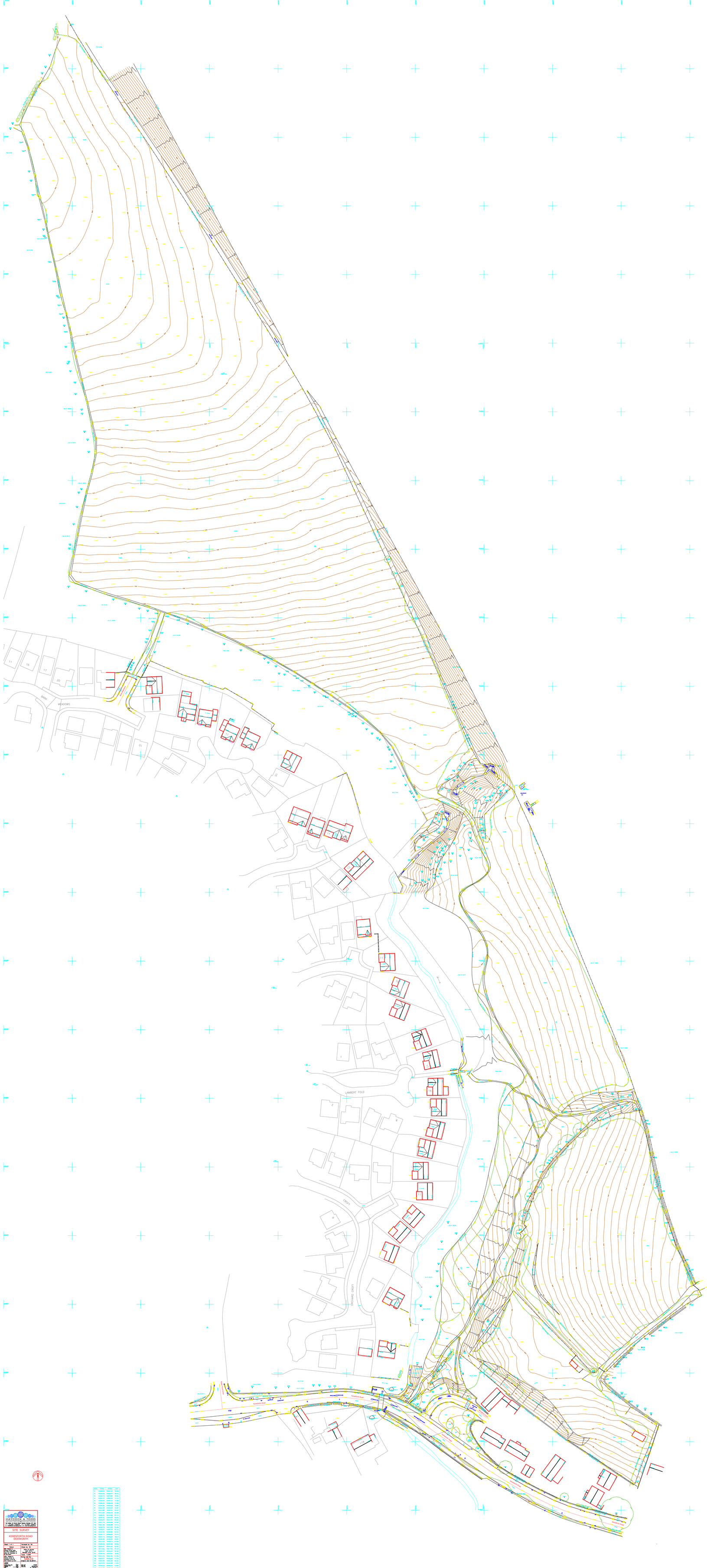
7.2 Refer to Appendix 4 for the initial design specification.

7.3 Currently the design specification does not allow for vehicle collision, a road restraint risk assessment has been undertaken which has concluded the use of containment kerbing, rather than a vehicle restraint system – refer to Appendix 5.

7.4 Further traffic assessment is recommended between the TAA, wall supplier and designer to ensure all technical parties are in agreement with the assessment.

7.5 If any party still feels there is a risk of vehicle collision then a vehicle restraint system must be implemented.

Appendix 1 – Survey


MEADOWS
ORCHARD CROFT
LAMBERT FOLD
Kersesforth Road
HAYCOCK & TODD
SITE SURVEY
KERESFORTH ROAD
DODWORTH

Appendix 2 – Site characteristics

GRASS EMBANKMENT MAX. GRADIENT 1:3

WATERCOURSE

REDLINE BOUNDARY

WOODLAND

11.5 DOWN GRADIENT >>

2.0m

5.5m

2.0m

GRASS EMBANKMENT MAX. GRADIENT 1:3

R65.0m CENTRE LINE

PROPOSED RETAINING STRUCTURE

WOODLAND

WATERCOURSE

GRASS CUTTING MAX. GRADIENT 1:3

2.0m

NEW 'CONVENTIONAL STREET' 20mph

5.5m

2.0m

R80.0m CENTRE LINE

<< 12.4 DOWN GRADIENT

GRASS CUTTING MAX. GRADIENT 1:3

Rev.	Date	Revision Details	Drawn	Checked
P01	19.08.24	FIRST ISSUE	ND	

QUEENSBERRY DESIGN
CIVIL, STRUCTURAL, ARCHITECTURAL & GEOTECHNICAL CONSULTANTS
QUEENSBERRY DESIGN YORKSHIRE LTD
SUITE 12A, BROOKFIELD COURT, SELBY ROAD, LEEDS, LS25 1NB
T: 0113 517 7099
www.queensberrydesign.co.uk

Client: KEEPMOAT HOMES

Project: KERESFORTH ROAD
DODWORTH
BARNSLEY

Title: SITE CHARACTERISTICS

Drawn	Checked	Date
ND		16.08.2024

Drawing Number: 0010-QD-XX-S-DR-C-00-21

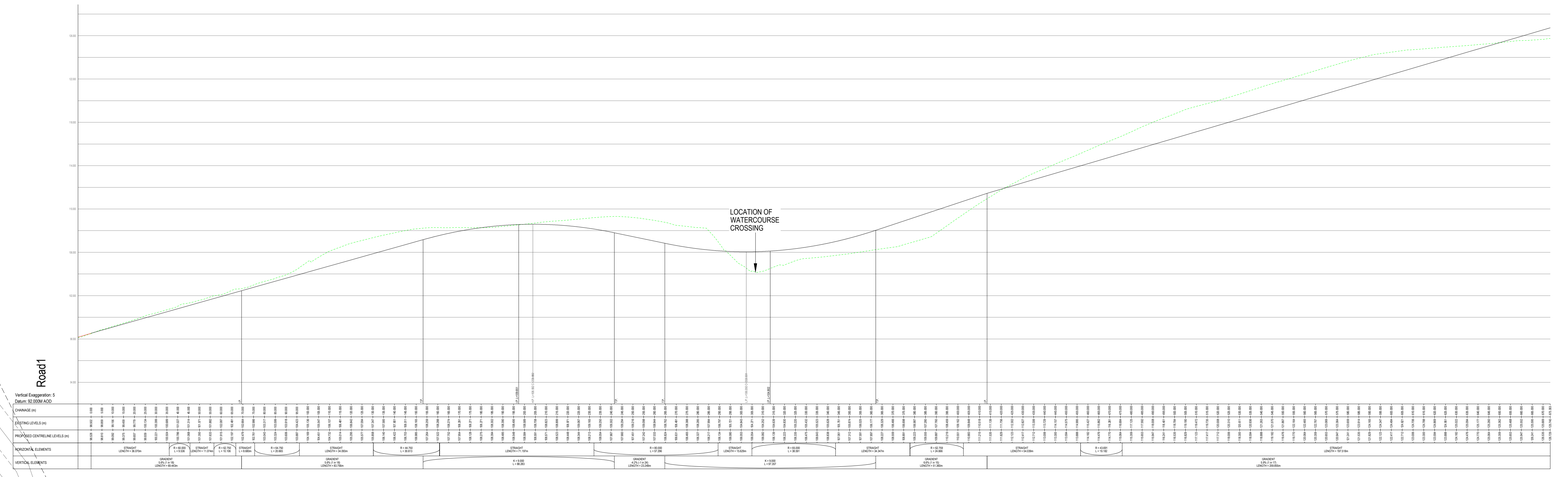
Drawing Status	Scale	Rev.
INFORMATION	1:500 - A1	P01

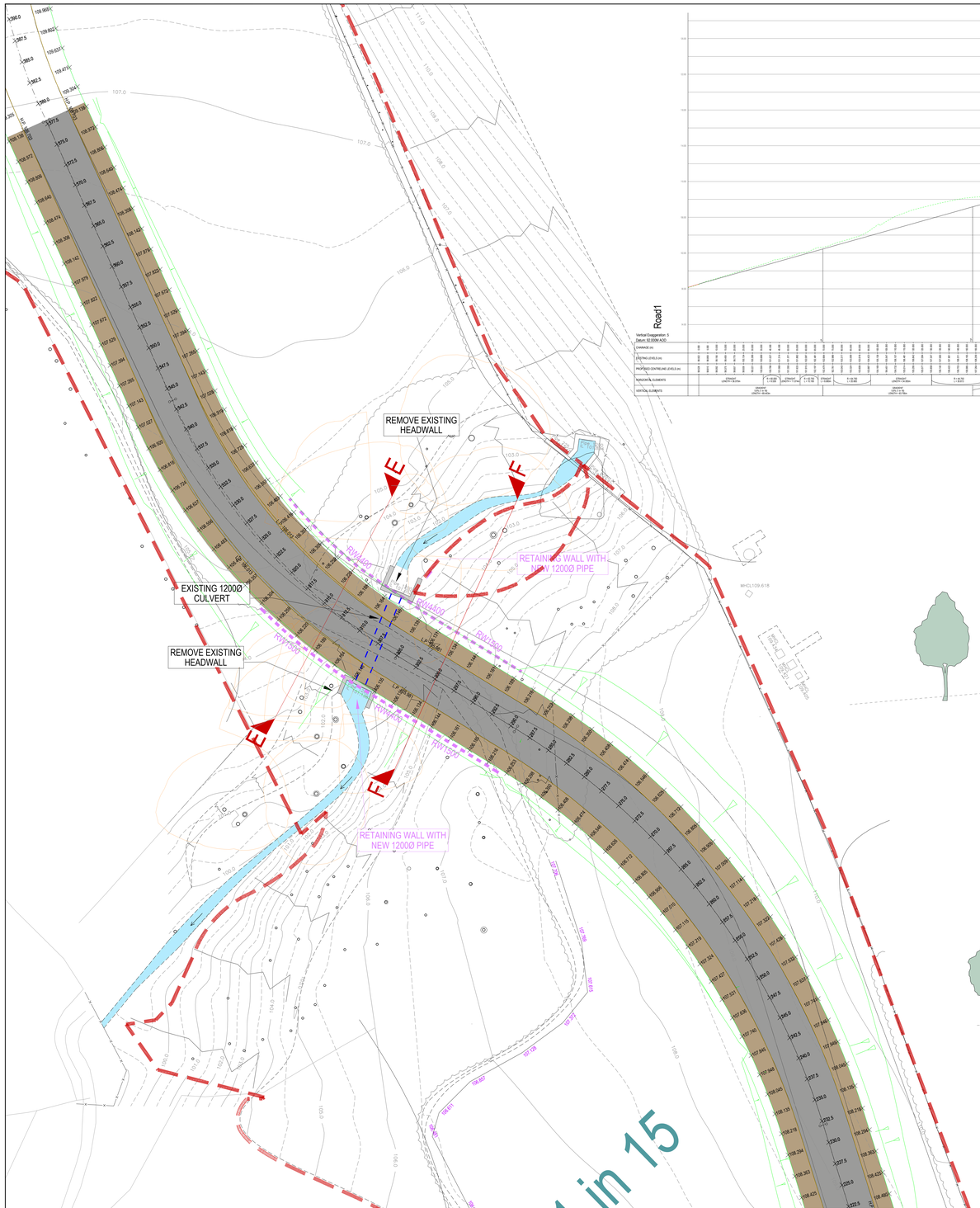
Appendix 3 – Initial Highway Design

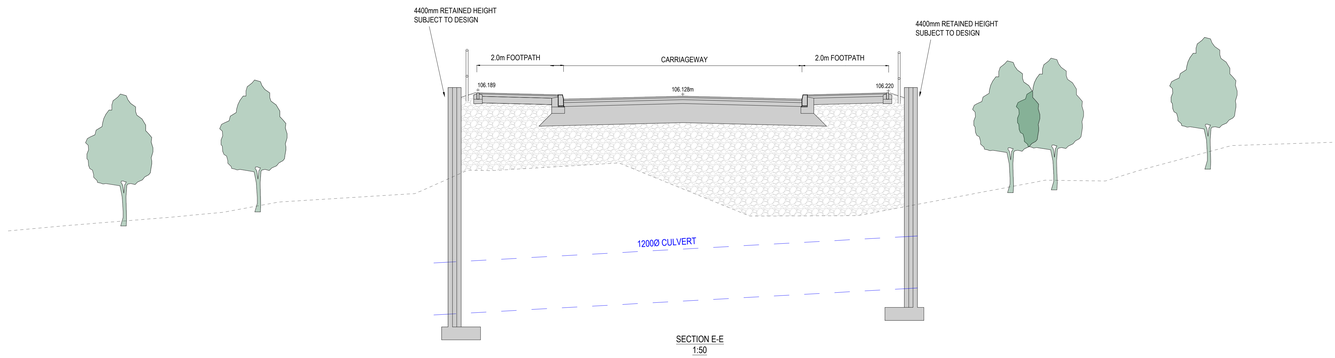
Only PDF/ DWF Issues of this drawing are controlled. All other formats (eg. DWG AutoCAD FILES) are UN-controlled and are used at your own risk.

KEY

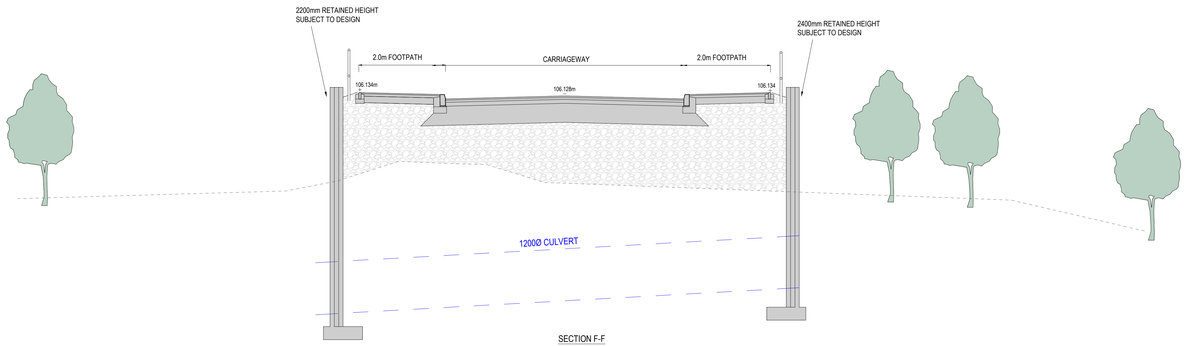
- PROPOSED CARRIAGEWAY
- PROPOSED FOOTPATH
- PROPOSED FOOTPATH LEVEL
- PROPOSED RETAINING WALLS
- SECTION CUT LINE







SECTION E-E
1:50



SECTION F-F
1:50

0 1.25 2.5 m
1:50

0 12.5 25 m
1:500

Rev	Date	Revision Details	Drawn	Checked
P04	16.07.24	KEY ADDED	ND	
P03	24.05.24	ROAD ALIGNMENT AMENDED	ND	
P02	14.05.24	RED LINE ADDED	ND	
P01	25.04.24	FIRST ISSUE	ND	

QUEENSBERRY DESIGN
CIVIL,STRUCTURAL, ARCHITECTURAL & GEOTECHNICAL CONSULTANTS
QUEENSBERRY DESIGN YORKSHIRE LTD
SUITE 12A, BROOKFIELD COURT, SELBY ROAD, LEEDS, LS25 1NB
0161 464 8640
www.queensberrydesign.co.uk

Client: KEEPMOAT

Project: KERESFORTH ROAD
DODWORTH
BARNSLEY

Title: PROPOSED SITE ACCESS
CONSTRUCTION SECTIONS
SHEET 2

Drawn	Checked	Date
ND		24.04.2024

Drawing Number: 0010-QD-XX-S-DR-C-00-02

Drawing Status	Scale	Rev.
INFORMATION	1:500/100 - A0	P04

Appendix 4 – Initial Retaining Wall Design

HAPAS

Tobermore Concrete Products Ltd
2 Lisnamuck Road
Tobermore
Co Londonderry BT45 5QF

Tel: 028 7964 2411 Fax: 028 7964 4145
e-mail: sales@tobermore.co.uk
website: www.tobermore.co.uk

BBA APPROVAL INSPECTION TESTING CERTIFICATION
TECHNICAL APPROVALS FOR CONSTRUCTION

HAPAS Certificate
15/H230
Product Sheet 1

TOBERMORE RETAINING WALL SYSTEM

SECURA GRAND CONCRETE BLOCK WALL SYSTEM FOR REINFORCED SOIL RETAINING WALLS AND BRIDGE ABUTMENTS

This HAPAS Certificate Product Sheet(1) is issued by the British Board of Agrément (BBA), supported by National Highways (acting on behalf of the Overseeing Organisations of the Department for Transport; Transport Scotland; the Welsh Government and the Department for Infrastructure, Northern Ireland), the Association of Directors of Environment, Economy, Planning and Transport (ADEPT), the Local Government Technical Advisers Group and industry bodies. HAPAS Certificates are normally each subject to a review every three years.
(1) Hereinafter referred to as 'Certificate'.

This Certificate relates to the Secura Grand Concrete Block Wall System for reinforced soil retaining walls and bridge abutments, comprising modular concrete block facing units, Fortrac Geogrids, graded granular material and compacted fill. The system is used for the construction of reinforced soil retaining walls and bridge abutments up to a maximum height of 9 metres.

CERTIFICATION INCLUDES:

- factors relating to compliance with HAPAS requirements
- factors relating to compliance with Regulations where applicable
- independently verified technical specification
- assessment criteria and technical investigations
- design considerations
- installation guidance
- regular surveillance of production
- formal three-yearly review.

KEY FACTORS ASSESSED

Mechanical properties — the method of connection between the geogrids and concrete block facing units has been assessed and long-term connection strength values determined for various wall heights and concrete block/geogrid combinations. The interface shear capacity between adjacent concrete block facing units in between layers of geogrid reinforcement has been assessed and is satisfactory (see section 7).

Performance of geogrids — the short- and long-term tensile strength of the geogrids, resistance to installation damage, weathering and environmental effects, and soil/geogrid interaction have been assessed. Data and reduction factors for use in design are given in Certificate 13/H197, Product Sheet 1 (see section 7).

Durability — when designed and installed in accordance with the provisions of this Certificate, the system will have adequate durability for its intended use as a retaining wall or bridge abutment (see section 9).

The BBA has awarded this Certificate to the company named above for the system described herein. This system has been assessed by the BBA as being fit for its intended use provided it is installed, used and maintained as set out in this Certificate.

On behalf of the British Board of Agrement

Date of Third issue: 12 May 2022

Originally certificated on 18 March 2015

Hardy Giesler
Chief Executive Officer

Requirements

In the opinion of the BBA, the Secura Grand Concrete Block Wall System for reinforced soil retaining walls and bridge abutments, when used in accordance with the provisions of this Certificate, will meet or contribute to meeting the requirements of the *Manual of Contract Documents for Highways Works* (MCHW)(1), Volume 1 *Specification for Highways Works* (SHW).

(1) The MCHW is operated by the Overseeing Organisations: National Highways, Transport Scotland, the Welsh Government and the Department for Infrastructure (Northern Ireland).

Regulations

Construction (Design and Management) Regulations 2015
Construction (Design and Management) Regulations (Northern Ireland) 2016

Information in this Certificate may assist the client, designer (including Principal Designer) and contractor (including Principal Contractor) to address their obligations under these Regulations.

See sections: 1 *Description* (1.2), 3 *Delivery and site handling* (3.1 and 3.3) and the *Installation* part of this Certificate.

Additional Information

CE marking

The Certificate holder has taken the responsibility of CE marking the concrete block facing units in accordance with harmonised European Standard BS EN 771-3 : 2011. The supplier of the geogrids has taken the responsibility of CE marking the geogrids in accordance with harmonised European Standard BS EN 13251 : 2016.

Technical Specification

1 Description

1.1 The Secura Grand Concrete Block Wall System for reinforced soil retaining walls and bridge abutments comprises:

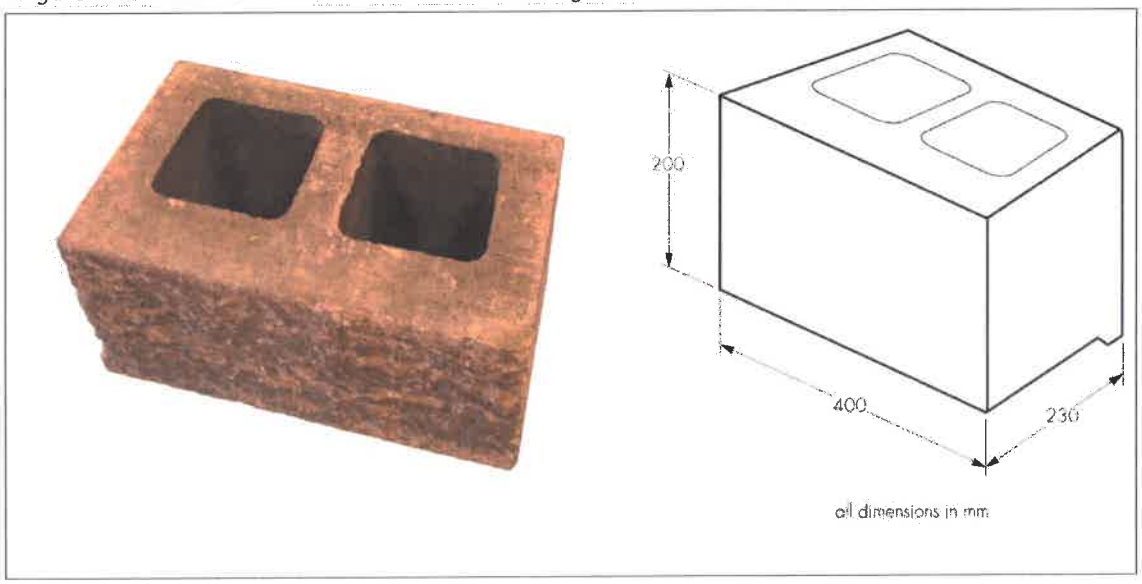
- Secura Grand Modular Concrete Block Facing Units
- Fortrac 35T, 55T and 80T Geogrids(1)
- granular material — used to fill the voids in, around and behind the concrete block facing units
- compacted fill material.

(1) Covered under Certificate 13/H197, Product Sheet 1.

Concrete block facing units

1.2 Modular Secura Grand Concrete Block Facing Units have a height of 200 mm, a depth of 230 mm and a width of 400 mm (see Figure 1). The weight of each block is 27 kg. The setback of the wall made using the system is 7.12°.

Figure 1 Secura Grand Modular Concrete Block Facing Units



1.3 The blocks are made with a split concrete finish and are available in three colours: Bracken, Heather and Slate. All pigments used for the coloration comply with BS EN 12878 : 2014.

1.4 The blocks are manufactured from concrete with a minimum 28 day compressive strength of 40 $N \cdot mm^{-2}$ and satisfy the requirements for durability of class XF2 exposure in accordance with BS 8500-1 : 2015.

1.5 The blocks conform to BS EN 771-3 : 2011 and have the essential characteristics given in Table 1 of this Certificate, as declared by the manufacturer.

Table 1 Secura Grand Modular Concrete Block Facing Units — essential characteristics in accordance with BS EN 771-3 : 2011

Characteristic (unit)	Manufacturer's declared value
Dimensions (mm)	As stated in the technical data sheets
Configuration	Soil and void
Compressive strength ($N \cdot mm^{-2}$) (at 7 days)	30
Reaction to fire	Euroclass A1
Gross dry density ($kg \cdot m^{-3}$)	2161

1.6 Corner blocks are available to form internal and external corners at 90°, and have the same unit and void size as the standard blocks. The front face and one side face have the same colour and finishing pattern as the standard blocks.

Geogrids

1.7 The following grades of Fortrac Geogrids(1) have been assessed by the BBA for use with the system:

- Fortrac 35T
- Fortrac 55T
- Fortrac 80T.

(1) Covered under Certificate 13/H197, Product Sheet 1.

Granular material

1.8 The material used to fill the voids in, around and behind the concrete block facing units must be well graded, angular, granular material with a maximum size of 20 mm without fines.

Compacted fill material

1.9 The compacted fill material must comply with the requirements set out in BS 8006-1 : 2010 and the MCHW, Volume 1.

2 Manufacture

2.1 The concrete block facing units are manufactured to an agreed specification by the Certificate holder. The ingredients are weighed by a computer-controlled weight batcher system. The concrete mix is placed in moulds and hydraulically pressed to get the initial base block shape. Once pressed, the blocks are cured before being split to give the final face finish.

2.2 The geogrids are manufactured by Huesker Synthetic GmbH. Further details are given in Certificate 13/H197, Product Sheet 1.

2.3 As part of the assessment and ongoing surveillance of product quality, the BBA has:

- agreed with the manufacturer the quality control procedures and product testing to be undertaken
- assessed and agreed the quality control operated over batches of incoming materials
- monitored the production process and verified that it is in accordance with the documented process
- evaluated the process for management of nonconformities
- checked that equipment has been properly tested and calibrated
- undertaken to carry out the above measures on a regular basis through a surveillance process, to verify that the specifications and quality control operated by the manufacturer are being maintained.

2.4 The manufacturer's management system for the concrete block facing units has been assessed and registered as meeting the requirements of BS EN ISO 9001 : 2015 by BSI (Certificate FM 11763). The manufacturer's management system for the geogrids has been assessed and registered as meeting the requirements of ISO 9001 : 2015 by TÜV NORD CERT GmbH, Germany (Certificate 04 100 970084).

3 Delivery and site handling

Concrete block facing units

3.1 The concrete block facing units are delivered to site shrink-wrapped on pallets and secured with plastic straps. They carry a manufacturer's label identifying the product type and batch code. Pallets should not be stacked more than two high.

3.2 To prevent damage, care should be taken in transit and handling. Damaged blocks must not be used. During prolonged periods of storage on site, the blocks should remain covered on pallets.

Geogrids

3.3 The geogrids are delivered, and should be handled and stored, as detailed in Certificate 13/H197 Product Sheet 1.

Assessment and Technical Investigations

The following is a summary of the assessment and technical investigations carried out on the Secura Grand Concrete Block Wall System for reinforced soil retaining walls and bridge abutments.

4 Use

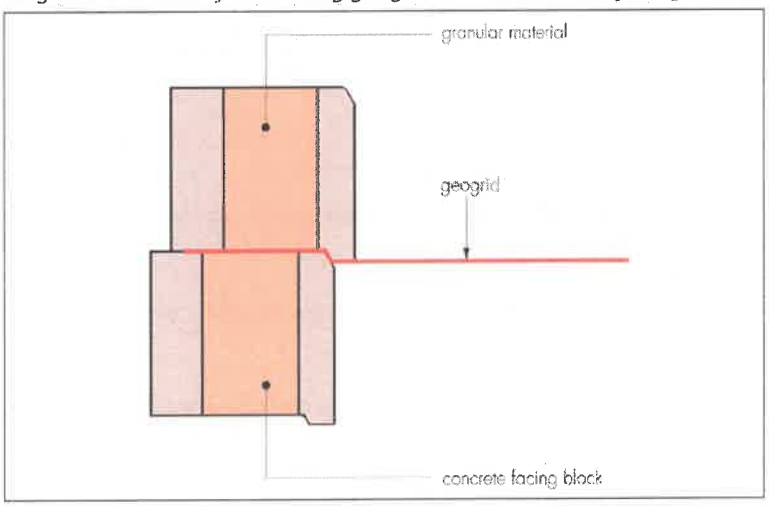
4.1 When designed and installed in accordance with this Certificate, the Secura Grand Concrete Block Wall System for reinforced soil retaining walls and bridge abutments is satisfactory for the construction of reinforced soil retaining walls and bridge abutments up to a maximum height of 9 metres. Walls above this height require special consideration and are outside the scope of this Certificate.

4.2 Structural stability of the system is achieved through:

- interface shear capacity between adjacent rows of blocks
- the connection strength between the blocks and geogrid layers at each layer of geogrid
- the tensile strength of the geogrids
- the embedment and resistance to sliding and pull out of the geogrids from the compacted fill material.

4.3 The connection between the geogrids and concrete block facing units is achieved by friction between the blocks and the geogrid, interlock between the geogrid and the granular material used to fill the hollow core of the blocks, and the concrete lips at the bottom of each block (see Figure 2). It is critical that construction of the connection is carried out and is closely supervised (see the *Installation* part of this Certificate).

Figure 2 Method of connecting geogrid to concrete block facing units



4.4 Prior to the commencement of work, the designer must satisfy the design approval and certification procedures of the relevant Highway Authority.

4.5 The BBA has not assessed the structures for supporting parapet loading caused by vehicle collision at the top of the blocks.

4.6 Prior to commencement of work, the designer must satisfy the design approval, certification and (where live traffic is affected) the traffic management requirements of the relevant Highways Authority, and all similar requirements of adjacent landowners and stakeholders; temporary stability of excavations may need specific consideration.

4.7 The BBA has not assessed the structure for supporting loading from barriers or fences at the top of the wall. Separate and specific design consideration and approval of this aspect of design will be required.

4.8 Where there is risk of vehicle impact or other damage occurring, or the structure supports sensitive assets, or climbing of the wall is an identified risk, measures to limit risk to within tolerable limits should be designed and implemented.

4.9 In addition to the factors covered in section 6, attention must also be paid in design to:

- site preparation
- compacted fill material properties
- the specification for placing and compaction of the compacted fill material
- drainage behind the wall
- protection of the geogrid against damage during installation.

4.10 It is considered that with correct design and workmanship, and by following the recommendations of this Certificate, normally accepted tolerances of line and level for the construction of retaining walls, as defined in BS 8006-1 : 2010, Table 18, can be achieved.

4.11 Particular attention should be paid to changes in direction of walls where overlapping of the geogrids may occur. BS 8006-1 : 2010 also gives guidance on typical layout plans for the geogrids (reinforcing elements) in bridge abutments.

4.12 Where the wall height is not gradually reduced to zero over the length of the wall, the design must include edge restraint. This can be achieved by means of a short section of wall constructed at 90 degrees to the main wall.

5 Practicability of installation

The system is designed to be installed by trained contractors in accordance with the specifications and construction drawings (see the *Installation* part of this Certificate).

6 Design

Methodology

6.1 Reinforced soil retaining walls and bridge abutments constructed using the system must be designed in accordance with BS 8006-1 : 2010 and the MCHW, Volume 1.

6.2 In accordance with BS 8006-1 : 2010, Annex B, the required design life for permanent walls and bridge abutments is 120 years.

6.3 The design must consider the following issues relating to the performance of the geogrids and concrete block facing units:

- the long-term design strength and post construction creep strain for the geogrids
- the length of embedment of the geogrids
- the connection strength between the geogrid and concrete block facing units
- the interface shear capacity of the blocks between layers of geogrid reinforcement.

Design strength of geogrids [ultimate limit state (ULS)]

6.4 The designer must carry out design checks to ensure that the geogrids have adequate long-term tensile strength at each layer of reinforcement, to satisfy ULS design criteria as defined in BS 8006-1 : 2010. Short- and long-term tensile strength values and material reduction factors for use in the design of the geogrids are given in Certificate 13/H197, Product Sheet 1.

Length of embedment of geogrids

6.5 The designer must carry out design checks to ensure that the geogrids have sufficient length of embedment within the compacted fill material to prevent pull-out of the geogrid. Soil/geogrid interaction coefficients for use in the design are given in Certificate 13/H197, Product Sheet 1.

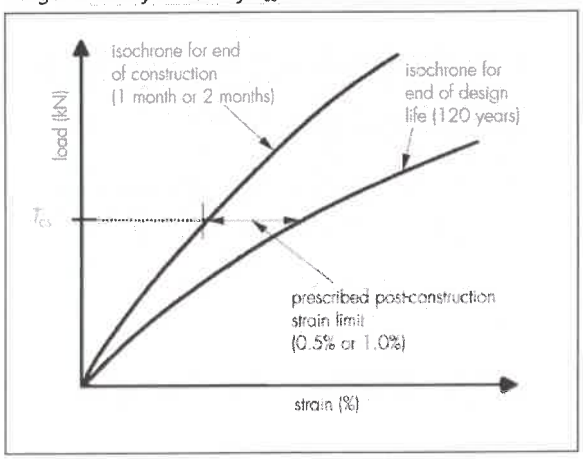
Design strength of geogrids [serviceability limit state (SLS)]

6.6 The SLS design strength of the geogrid ($T_{D\,(SLS)}$), should be taken as T_{CS}/f_m, where:

- T_{CS} is the tensile load in the reinforcement which induces the prescribed limit value of post-construction strain in the geogrid
- f_m is the partial material factor.

6.7 The prescribed post-construction strain limit and the tensile load that would create the prescribed post-construction strain (T_{CS}) are illustrated in Figure 3.

Figure 3 Definition of T_{cs}



6.8 The prescribed maximum allowable post-construction creep strains allowed by BS 8006-1 : 2010 for the SLS of reinforced soil retaining walls and bridge abutments are shown in Table 2 of this Certificate.

Table 2 Serviceability limits on post-construction internal strains for bridge abutments and retaining walls

Structure	Strain (%)	Design period for the purposes of determining limiting strain
Bridge abutments and retaining walls with permanent structural loading	0.5	2 months to 120 years
Retaining walls with no applied structural loading, ie transient live loadings only	1.0	1 month to 120 years

6.9 Post-construction strain can be related to the average load in the reinforcement. The average SLS design load T_{avj} that the geogrid must resist is calculated in accordance with BS 8006-1 : 2010. The average load in the jth level T_{avj}, is related to the maximum load in the reinforcement (T_j) by a factor k such that $T_{avj} = T_j/k$. The factor k has a minimum value of unity and generally falls in the range of 1.0 to 2.0. Where the distribution of tensile load along the loaded length of the reinforcement is not proven by field measurements, the factor k should be taken as unity. In all cases $T_{avj} \leq T_{D(SLS)}$.

6.10 Isochronous curves, design values for T_{CS} and reduction factors for determination of $T_{D(SLS)}$ are given in sections 7.2 to 7.5.

Connection strength between the geogrids and concrete block facing units

6.11 The design connection strength between the geogrids and concrete block facing units (T_{Dconn}) should be determined for the ULS and checks should be made to ensure that it is not exceeded by the design load (T_j) at each level, ie $T_j \leq T_{Dconn}$. Particular care should be taken during the design of bridge abutments to ensure that adequate reinforcement is provided, and adequate connection strengths are achieved at the top of the wall and in front of bank seats.

6.12 The design connection strength (T_{Dconn}) is determined using the formula $T_{Dconn} = T_{conn}/f_m$ where:

- T_{conn} is the long-term connection strength derived from testing (see section 7)
- f_m is the material safety factor for the geogrid (see section 7)

6.13 The minimum value of load factor used in determining the design load should be 1.5 for all designs using the wall system.

Interface shear capacity between concrete block facing units

6.14 The system has adequate interface shear capacity when designed and installed in accordance with this Certificate.

Specification of compacted fill material

6.15 The designer should specify the relevant properties of the compacted fill material for the reinforced soil structure deemed acceptable for the purposes of the design. Acceptable materials should meet the requirements of BS 8006-1: 2010 and the MCHW, Volume 1, Series 600.

7 Mechanical properties

Long-term tensile strength of geogrids

7.1 Short- and long-term strength values and reduction factors required for design of the geogrids are given in Certificate 13/H197, Product Sheet 1. These include:

- characteristic short-term tensile strengths (T_{char})
- long-term creep rupture strengths (T_{CR})
- reduction factors for installation damage (RF_{ID}), weathering (RF_W) and environmental degradation (RF_{CH})
- factors of safety for extrapolation of data (f_s).

Soil/geogrid interaction

7.2 Soil/geogrid interaction coefficients for use in design are given in Certificate 13/H197, Product Sheet 1.

Post construction strain in geogrids

7.3 Values for T_{CS} may be estimated from the appropriate isochronous curves. A typical set of isochronous curves for the Fortrac Geogrid product range is shown in Figure 4. Values of T_{CS} for Fortrac 35T, Fortrac 55T and Fortrac 80T are given in Table 3.

Figure 4 Iscochronour curves — Fortrac Geogrids

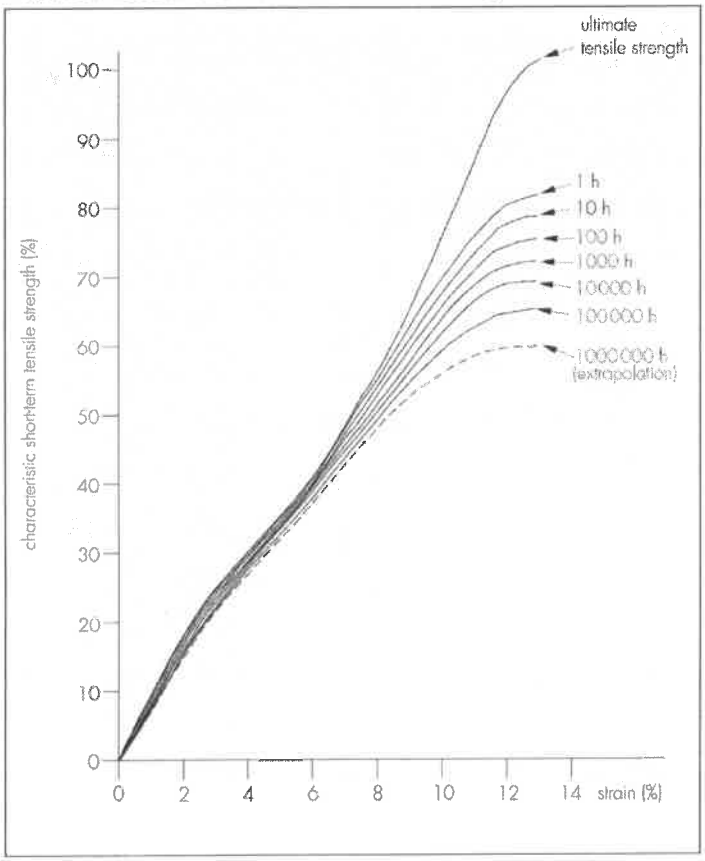


Table 3 Tensile load (T_{CS}) inducing prescribed post-construction strain limits

Geogrid grade	T_{CS} (kN·m^{-1}) prescribed post construction strain limits	
	0.5%	1.0%
Fortrac 35T	17.1	18.5
Fortrac 55T	26.9	29.1
Fortrac 80T	39.2	42.4

7.4 Long-term connection strength values (T_{conn}) for the wall system have been derived from short-term tests in line with the National Concrete Masonry Association *Design Manual for Segmental Retaining Walls (Second edition 2002)* and ASTM D6638-11. Connection efficiencies determined from these tests have been applied to the long-term creep rupture strength (T_{CR}) values for the geogrids approved for use with the system, to determine the relevant long-term connection strengths (T_{conn}). The results are shown in Table 4 of this Certificate and can be used to determine the design connection strength (T_{Dconn}) as set out in section 6.

Table 4 Long-term connection strength for Fortrac geogrids (T_{conn})[1][2]

Geogrid grade	T_{CR} (kN·m^{-1})	Height of wall above geogrid layer (m)	T_{conn} (kN·m^{-1})
Fortrac 35T	21.9	0.7≤H<2.3	6.1
		2.3≤H<5.0	9.2
		5.0≤H<6.5	9.4
		6.5≤H<8.2	10.5
Fortrac 55T	34.4	0.7≤H<2.3	7.1
		2.3≤H<5.0	12.9
		5.0≤H<6.6	13.3
		6.6≤H<8.1	14.5
Fortrac 80T	50.1	1.7≤H<3.3	8.9
		3.3≤H<6.6	12.7
		6.6≤H<8.2	15.7
		8.2≤H<9.0	20.3

(1) For a design life of 120 years and at a design temperature of 20°C.
(2) Assumes a density of 1500 kg·m^{-3} for the graded granular material used to fill the hollow core of the concrete block facing units.

7.5 The reduction factors and factors of safety shown in Table 5 should be used to determine the material factor (f_m) required for calculation of the ULS design connection strength (T_{Dconn}), where $f_m = RF_{ID} \times RF_W \times RF_{CH} \times f_s$.

Table 5 Reduction factors for determination of T_{Dconn}

Reduction factor	Value and conditions of use/limitations
RF_{ID}	A value of 1.00 can be used for all grades of geogrid, as short-term installation damage at the point of connection is already taken into account during the full scale connection strength tests
RF_W, RF_{CH}, f_s	As set out in Certificate 13/H197 PS1 according to geogrid specification selected and conditions of use[1]

(1) pH levels within and immediately behind the wall are assumed to be the same as those in the compacted fill material.

8 Maintenance

The exposed faces of the concrete block facing units may require periodic maintenance, to remove dirt build up, mould and moss growth. All other components are confined within the wall and/or compacted fill and do not require maintenance.

9 Durability

9.1 When designed and installed in accordance with this Certificate, the system will have adequate durability for the required 120 year design life of a retaining wall and bridge abutment in the conditions likely to be encountered in the UK.

9.2 Where the blocks are to be embedded in potentially aggressive soils, the guidance given in BS 8500-1 : 2015 and BRE Special Digest 1 : 2005 should be followed.

10 Reuse and recyclability

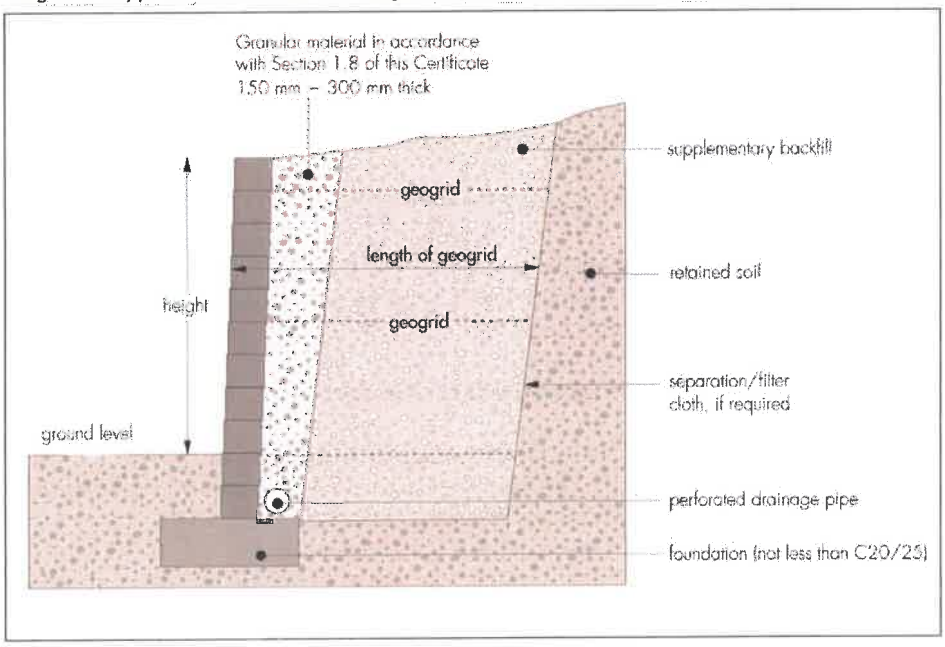
The concrete block facing units can be crushed and re-used as aggregate. The compacted fill material can also be reused.

11 General

11.1 Installation of the Secura Grand Concrete Block Wall System for reinforced soil retaining walls and bridge abutments should be in accordance with BS 8006-1 : 2010 and BS EN 14475 : 2006. Detailed information on installation can be found in the Certificate holder's Installation Guide.

11.2 A typical cross section of a reinforced wall is shown in Figure 5.

Figure 5 Typical cross section through reinforced soil retaining wall



11.3 Close supervision is required, particularly during construction of the geogrid to concrete block facing unit connection.

12 Procedure

12.1 The blocks are laid on a levelling pad composed of either well-graded, good compactable material (DTP Type 1) or a suitable plain concrete foundation (not less than C20/25). The foundation should have a minimum thickness of 100 mm and should be set at a level to accommodate two blocks below ground level.

12.2 It is important that the first course of concrete block facing units is laid accurately to the correct line and level to avoid compounding errors in alignment as the wall is built. When laying the first course, the nib from the base of the blocks needs to be removed. This can be achieved using a bolster chisel and club hammer.

12.3 The blocks should be positioned with a gap of 2 to 3 mm between blocks to maintain vertical alignment and to allow for any movement of the ground. Blocks should be laid with a staggered bond.

12.4 Granular material as specified in section 1.8 is placed and compacted into the hollow cores of the blocks up to the top of the blocks and to a thickness of 150 to 300 mm width behind the blocks. Compacted fill material meeting the requirements of section 6.15 is placed behind the granular material.

12.5 A perforated drainage pipe is laid at the back of the wall along the trench to a suitable outfall and should be vented to a daylight or stormwater system.

12.6 The compaction requirements for the compacted fill depend on the fill type selected, but can be found in the MCHW, Volume 1, Clause 612. Heavy plant exceeding one tonne should not operate within two metres of the face of the wall, and a vibrating plate compactor of less than one tonne must carry out compaction within this zone. Frequent checks must be made to the alignment of the face to ensure that any disturbance from the compaction process is promptly corrected.

12.7 A suitable length of geogrid is cut from the roll and laid on top of the block course 25 mm back from the block face. The geogrid should be placed with the machine direction perpendicular to the wall face and pulled back over the compacted area.

12.8 The next course of blocks is then laid on the first, with each block pushed forward into position, ensuring that the vertical joints are offset to achieve a staggered bond.

12.9 The geogrid is pulled at the back to remove any slack and the corners staked to hold the back edge in place. The geogrid is tensioned at right angles to the plane of the facing, within a tolerance of ± 50 mm in a 5 m length.

12.10 Filling of the hollows in the blocks and behind the wall facing is then completed as described in section 12.4.

12.11 The frequency of the geogrid layers depends on the design and should be indicated on the design drawings. The distance between the geogrid layers should not be greater than four courses.

12.12 Compacted fill should be placed by mechanical plant with an opening bucket, avoiding trafficking of unprotected geogrids, and should cover the grid reasonably uniformly.

12.13 During construction it is particularly important to ensure that:

- fill is properly compacted, especially close to blocks
- at each construction stage, the level of the compacted fill coincides with the level of the block connection to prevent the risk of voids occurring below the geogrid.

12.14 The general construction procedure is repeated until the required level for the coping unit is reached.

12.15 Convex and concave curves (on plan) can be formed using standard blocks. Internal and external 90° corners can be formed using corner blocks (see section 1.6). Further guidance on curves and corners, including the placement of the geogrids, can be found in the Certificate holder's installation instructions.

12.16 Where accurate cutting of blocks is required on site, disc-cutting techniques may be used, for which appropriate precautions must be taken to mitigate against hazards associated with dust.

Technical Investigations

13 Investigations

13.1 The manufacturing process for the blocks was evaluated, including the methods adopted for quality control, and details were obtained of the quality and composition of the materials used.

13.2 An examination was made of test data relating to:

- the compressive strength and gross dry density of the blocks
- durability
- performance of the retaining wall system under fire test conditions
- the connection strength between the geogrids and blocks
- interface shear capacity between the blocks.

13.3 An assessment was made of the method of installation to assess the practicability and ease of construction of the system.

13.4 Dimensional check tests were carried out on the blocks.

Bibliography

ASTM D 6638-11 *Standard Test Method for Determining Connection Strength Between Geosynthetic Reinforcement and Segmental Concrete Units (Modular Concrete Blocks)*

BRE Special Digest 1 : 2017 *Concrete in aggressive ground*

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

BS EN 771-3 : 2011 + A1 : 2015 *Specification for masonry units — Aggregate concrete masonry units (dense and lightweight aggregates)*

BS EN 12878 : 2014 *Pigments for the colouring of building materials based on cement and/or lime — Specifications and methods of test*

BS EN 13251 : 2016 *Geotextiles and geotextile-related products — Characteristics required for use in earthworks, foundations and retaining structures*

BS EN 14475 : 2006 *Execution of special geotechnical works — Reinforced fill*

BS EN ISO 9001 : 2015 *Quality management systems — Requirements*

Manual of Contract Documents for Highway Works, Volume 1 *Specification for Highway Works*

14 Conditions

14.1 This Certificate:

- relates only to the product/system that is named and described on the front page
- is issued only to the company, firm, organisation or person named on the front page – no other company, firm, organisation or person may hold or claim that this Certificate has been issued to them
- is valid only within the UK
- has to be read, considered and used as a whole document – it may be misleading and will be incomplete to be selective
- is copyright of the BBA
- is subject to English Law.

14.2 Publications, documents, specifications, legislation, regulations, standards and the like referenced in this Certificate are those that were current and/or deemed relevant by the BBA at the date of issue or reissue of this Certificate.

14.3 This Certificate will remain valid for an unlimited period provided that the product/system and its manufacture and/or fabrication, including all related and relevant parts and processes thereof:

- are maintained at or above the levels which have been assessed and found to be satisfactory by the BBA
- continue to be checked as and when deemed appropriate by the BBA under arrangements that it will determine
- are reviewed by the BBA as and when it considers appropriate.

14.4 The BBA has used due skill, care and diligence in preparing this Certificate, but no warranty is provided.

14.5 In issuing this Certificate the BBA is not responsible and is excluded from any liability to any company, firm, organisation or person, for any matters arising directly or indirectly from:

- the presence or absence of any patent, intellectual property or similar rights subsisting in the product/system or any other product/system
- the right of the Certificate holder to manufacture, supply, install, maintain or market the product/system
- actual installations of the product/system, including their nature, design, methods, performance, workmanship and maintenance
- any works and constructions in which the product/system is installed, including their nature, design, methods, performance, workmanship and maintenance
- any loss or damage, including personal injury, howsoever caused by the product/system, including its manufacture, supply, installation, use, maintenance and removal
- any claims by the manufacturer relating to CE marking.

14.6 Any information relating to the manufacture, supply, installation, use, maintenance and removal of this product/system which is contained or referred to in this Certificate is the minimum required to be met when the product/system is manufactured, supplied, installed, used, maintained and removed. It does not purport in any way to restate the requirements of the Health and Safety at Work etc. Act 1974, or of any other statutory, common law or other duty which may exist at the date of issue or reissue of this Certificate; nor is conformity with such information to be taken as satisfying the requirements of the 1974 Act or of any statutory, common law or other duty of care.

British Board of Agrément
Bucknalls Lane
Watford
Herts WD25 9BA

tel: 01923 665300
clientservices@bbacerts.co.uk
www.bbacerts.co.uk

Tobermore

Keepmoat Homes

Queensberry DESIGN LIMITED

Secura Feasibility Proposal

Client: Keepmoat Homes

Site: Keresforth Rd, Dodworth

Date: 13/06/2024

Reference: TSE-01667

Tobermore Secura Support Timeline

01
Identify
Identify a site requiring retaining before going out to tender (the earlier the better).

02
Preliminary Designs
Send External Works (levels plans) inc. SI report to Tobermore for a site-specific preliminary Design/ take-off and quotation.

03
Tender Stage
Add Secura details into the Tender package for accurate site-specific cost comparison against your current/standard spec.

04
Design Meeting
Once confirmed you want to use Secura, organise a Design meeting with Tobermore, RW Designer (Tobermore's Network of Chartered Engineers) and your civil/structural engineer.

05
Detail Design Stage
Appoint RW Designer (Tobermore's Network of Chartered Engineers) for formal detail designs inc. indemnity.

06
Review & VE Meeting
2nd Design meeting to review site drawings and begin Value-Engineering (converting corners to curves etc and highlighting areas of concern.)

07
Construction
Issue drawings to appointed groundworks sub-contractor so they can arrange a Pre-construction meeting with Tobermore Commercial team.

Why Work With an SRC

What is a Secura Registered Contractor?

The Tobermore Secura Registered Contractor scheme is a network of skilled professionals who have experience in the successful installation of Secura Retaining Walls.

Why use Secura Registered Contractors?

Here's why developers already choose our registered contractors:

- They are experienced in Secura segmental retaining wall construction so you can guarantee quality workmanship.
- It ensures smooth construction on site that in turn reduces costly delays.
- They have experience in tendering for Secura retaining walls, so you know you're getting accurate pricing.
- We only approve well established contractors so you can have confidence in your decision.
- Our registered contractors have access to exclusive resources that can benefit everyone involved.
- You can receive greater onsite support from Tobermore.

Secura Pre-Construction Meetings

What is a Pre-Construction meeting?

The Tobermore Pre-Construction meeting is an explanation and delivery of the Secura Grand installation guidelines by a Tobermore representative. A Pre-Construction meeting is standard offering for our most valued customers, whether you are a supply chain customer or an SRC.

Tobermore representatives will give a detailed explanation of the installation guidelines applicable to the site and be on-hand to answer all questions from the wall installers. We also provide the support of a bespoke Construction Support Pack that includes site specific niche details so you can be assured every aspect of the build is covered.

The Pre-Construction meeting is one of the benefits you receive by being one of our most valued customers. Please enquire with your local Tobermore representative to book your Pre-Construction Meeting now!

Tobermore – Secura Feasibility Proposal

Client:	Keepmoat Homes
Site:	Keresforth Rd, Dodworth
Date:	13/06/2024
Reference:	TSE-01667

Dear Sir / Madam,

The following is our proposal for the above project. We have been asked to provide estimated quantities and indicative sections for the retaining walls at the proposed **'Keresforth Rd, Dodworth'** site.

We propose a Tobermore Secura Grand retaining solution and have considered Secura Grand retaining walls with a maximum retained height of **4.4m**.

We have included concept sections indicative of the retained heights of **4.4m** for the Tobermore Secura Grand retaining walls these can be seen within this document. We have also included any specific construction details that we have identified within the site.

These concept drawings **do not take into consideration site specific soil conditions or slope geometry**, any specific concerns about site conditions are to be discussed at formal design stage.

For external corners Secura Grand corner blocks would be required in addition of Secura Grand Blocks. Coping blocks are optional but highly recommended for aesthetic purposes.

The quantities provided in this document are an approximate preliminary estimate of the proposed wall dimensions based off the provided information. All wall details should be confirmed prior to any appointment of a formal design with one of our engineering partners. This document **does not take into consideration wastage,** additional material should be considered within procurement, **contractors are responsible for their own procurement** and must review quantities prior to ordering.

Tobermore – Secura Feasibility Proposal

Value Engineering Opportunities and Site-Specific Comments:

After reviewing the provided information and producing this document we have provided comments on details we believe to be of use to the wall installer and client. These comments can be found below.

1. We have based this proposal on a max retained height of 4.4m but an overall construction height of 5.4m due to the level of the proposed culvert. Exact retained heights and detailed levels to be confirmed prior to detail design.

2. Wall sections under 1m of retained height with no additional loading or surcharge could possibly be constructed as a gravity wall. This would be confirmed by a geotechnical engineer, at formal design stage, after site conditions have been reviewed.

3. If using the geogrid reinforcement method, the geogrid used in construction must match that as specified by the appointed geotechnical engineer at formal design stage.

Assumptions:

This document, and the designs within, have been produced based on the following assumptions. Any specific concern about site specific conditions are to be looked at on appointment of a formal design with one of our partner geotechnical engineers.

Assumption	Notes
1	Foundation and retained material are assumed to be founded on inorganic clays, low to medium plasticity, gravelly, sandy, silty, lean clays with a friction angle of 28°.
2	We have not reviewed any provided SI report for the purpose of this preliminary design. Any specific concerns regarding ground conditions will be accommodated at formal design stage.
3	Maximum load of **10kPa** offset 300mm from the rear of the upper course of blocks.
4	**MAX 1:10** crest slopes present.
5	**MAX 1:3** toe slopes present.
6	Any building or structure in a retained zone does not impart loading onto the wall.

Tobermore – Secura Feasibility Proposal

Wall Quantities:

The estimated total quantities for the walls are as follows:

Total Wall Estimate:

280.0m² of Tobermore Secura Grand Blocks and **65.4m** of Secura Grand Copings.

Main Wall Breakdown:

Wall ID	Length (m)	Max Retained Height (m)	Area (m²)	Geogrid (m²)	Concrete Backfill (m³)
Wall 1	32.7	4.4	140.0	999.2	-
Wall 2	32.7	4.4	140.0	999.2	-
Totals	65.4		280.0	1998.4	-

Aggregate Quantities:

Wall ID	Levelling Pad (m³)	Reinforced Fill (m³)	Drainage Fill (m³)	Concrete Backfill (m³)	Retained Fill (m³)
Wall 1	3.9	392.4	42.0	-	80.3
Wall 2	3.9	392.4	42.0	-	80.3
Totals	7.8	784.8	84.0	-	160.6

Notes:

- ‘Levelling Pad’ quantities have been calculated based on a 600x200mm pad, exact levelling pad dimensions would be confirmed at formal design stage.
- ‘Reinforced Fill’ quantities are for use on geogrid walls only, the specification of fill will be confirmed by a geotechnical engineer at formal design stage. Class 6i granular material is the standard specification of reinforced fill.
- ‘Concrete Backfill’ quantities are provided where geogrid tails are not feasible. Geogrid quantities have been reduced accordingly.
- Retained Fill has been calculated from a 75° cut angle and is to be backfilled with site won material. If a shallower cut angle is required, doubling this quantity would account for a 60° slope and tripling this quantity would account for a 45° slope.
- These quantities have been provided on a preliminary basis only and must not be used for procurement purposes. This document does not take into consideration wastage, additional material should be considered within procurement. Contractors are responsible for their own procurement.

Tobermore – Secura Feasibility Proposal

What are EPDs?

An EPD is a document that lays out the environmental performance or impact of a construction product or material over time.

EPDs allow construction industry professionals to compare the environmental impact of different products and materials and make informed decisions about which to choose for their project.

For us here at Tobermore, it also means we can use the data from an EPD assessment to reduce the impact of our products and deliver ever-more sustainable options for the industry. We have calculated the estimated manufacturing and transport carbon for this specific project which is as follows:

This project generates a total manufacturing + transport carbon of 14,646.59kgs or 14.7tonnes.

Formal Design Appointment:

This document is not for construction and is provided on a preliminary basis - We are partnered with a network of Geotechnical Engineers who can be commissioned to produce full construction drawings.

Tobermore can provide a fee for an indemnified formal design upon request and can put customers in contact with the assigned engineer to progress the designs. An indemnified formal design can include wall elevations, location plan, bespoke cross-sections, and all relevant calculations.

Drawings:

In addition to the provided wall quantities, we have produced the below drawings to aid with the design process.

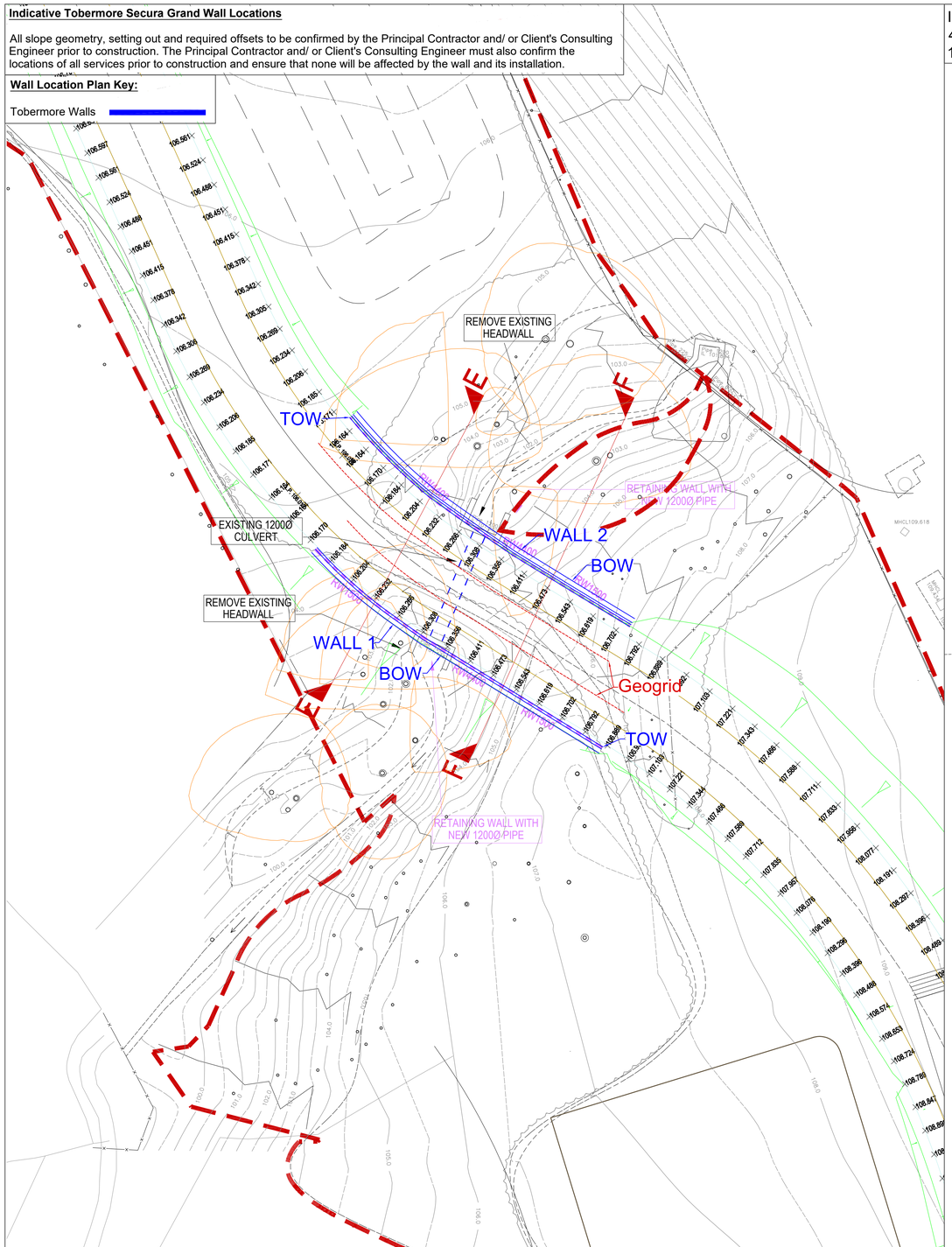
We have also included relevant drawings depicting specific construction details to aid with the design process, indicative locations of any details have been denoted on the attached wall location plan.

Indicative Tobermore Secura Grand Wall Locations

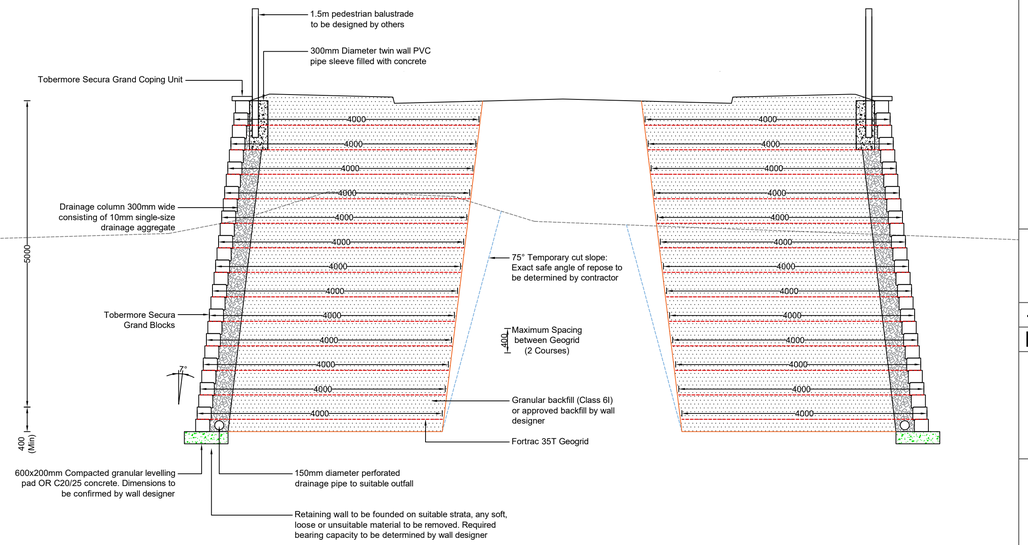
All slope geometry, setting out and required offsets to be confirmed by the Principal Contractor and/ or Client's Consulting Engineer prior to construction. The Principal Contractor and/ or Client's Consulting Engineer must also confirm the locations of all services prior to construction and ensure that none will be affected by the wall and its installation.

Wall Location Plan Key:

Tobermore Walls



Indicative Section A-A,
4.4m Geogrid Reinforced Wall
1:50



Disclaimer:
1- ALL DIMENSIONS ARE IN mm UNLESS OTHERWISE SPECIFIED.
2- FOR INSTALLATION REFER TO THE TECHNICAL GUIDE AVAILABLE FROM www.Tobermore.co.uk
3- ALL REFERENCES ARE TO THE LATEST BRITISH STANDARD AND EUROPEAN STANDARDS.
4- ALL DESIGNS SHOULD BE CHECKED BY A QUALIFIED ENGINEER.
5- SPECIALIST DESIGN ADVICE SHOULD BE SOUGHT PRIOR TO CONSTRUCTION.
6- TOBERMORE CONCRETE Ltd WILL NOT BE LIABLE FOR ANY LOSS OR DAMAGE RESULTING FROM THE USE OR RELIANCE ON THIS DRAWING.
7- REFER TO THE SUPPORTING DOCUMENTATION.

NOTES:
THIS DOCUMENT IS FOR PRELIMINARY USE ONLY, FULL CONSTRUCTION DRAWINGS CAN BE COMMISSIONED THROUGH ONE OF TOBERMORE'S ENGINEERING PARTNERS. IF YOU WOULD LIKE A QUOTE TO COMPLETE THIS WORK PLEASE CONTACT YOUR LOCAL TOBERMORE REPRESENTATIVE.

REV	DATE	BY	APPROVED
-	-	-	-

-FEASIBILITY ONLY-

-NOT FOR CONSTRUCTION-

Designer:

Tobermore

Customer:

Keepmoat Homes

Project Title:

Keresforth Rd, Dodworth

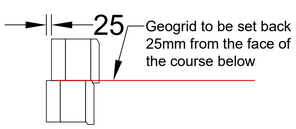
Drawing Title:

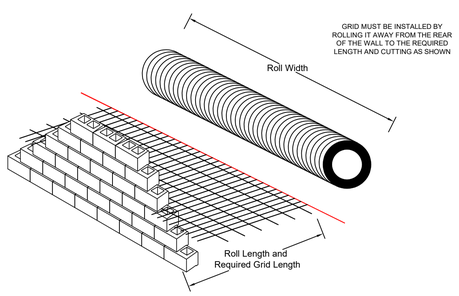
Tobermore Secura Grand Retaining Wall Details

Page:	Sheet 1 of 1	Drawn:	GD
Ref:	TSE-01667-A	Rev:	0
Date:	13/06/2024		

Scale 1:250 @ A1

Geogrid Placement Detail:





Geogrid Placement Rules:

1- The first layer of geogrid must be placed on the 1st course of Secura Grand.

2- Acending layers of geogrid must not be spaced more than 600mm apart or 3 courses of Secura Grand.

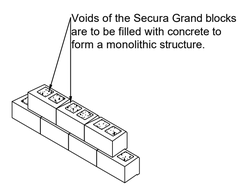
3- The final layer of geogrid must be placed no further than 400mm or 2 courses of Secura Grand from the finished ground level.

4- Where layers of geogrid step up or down there should be an overlap of geogrid layers to ensure all of the wall is reinforced. Where corners and curves are present placement of geogrid should be done as per Tobermore's installation guidelines.

5- Geogrid tail lengths for higher panels of wall should be used for intermediate panels of wall.

6- Geogrid must be installed by rolling it out perpendicular to the wall and cutting to the required length, the grid must not be rolled out longitudinally along the wall.

NHBC Concrete Infill Detail:



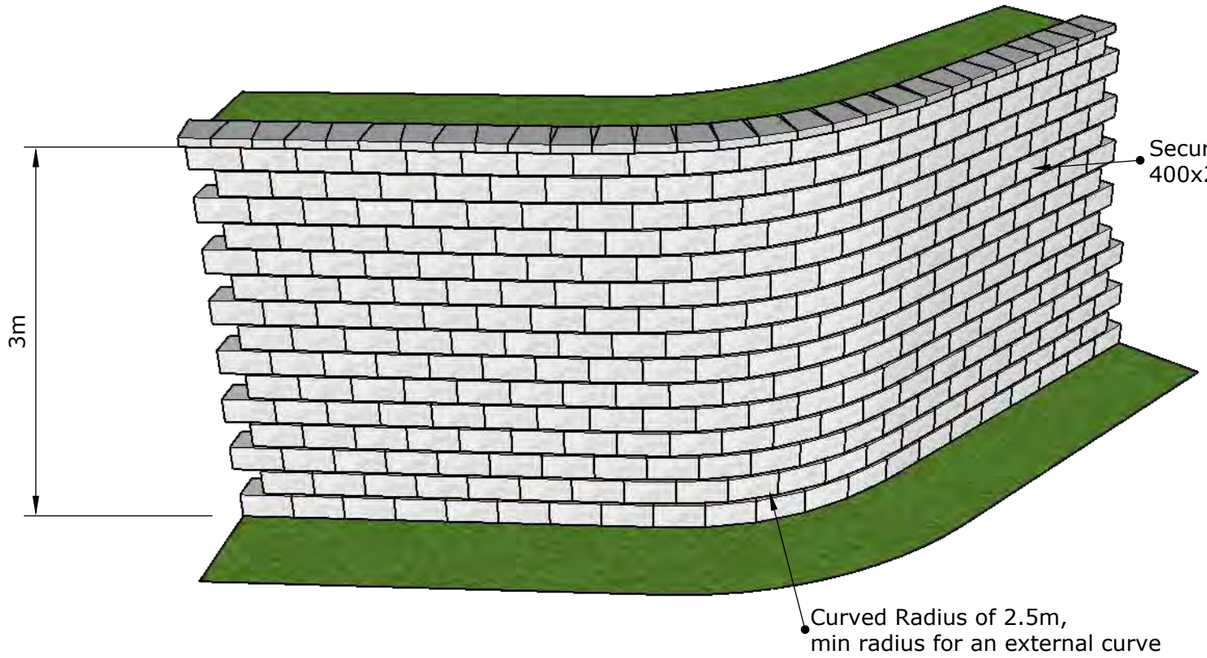
Concrete Backfill Rules:

1- Concrete specification to match that as specified by the appointed geotechnical engineer at formal design stage. A typical specification can be found in the Tobermore Technical guide available at www.tobermore.co.uk

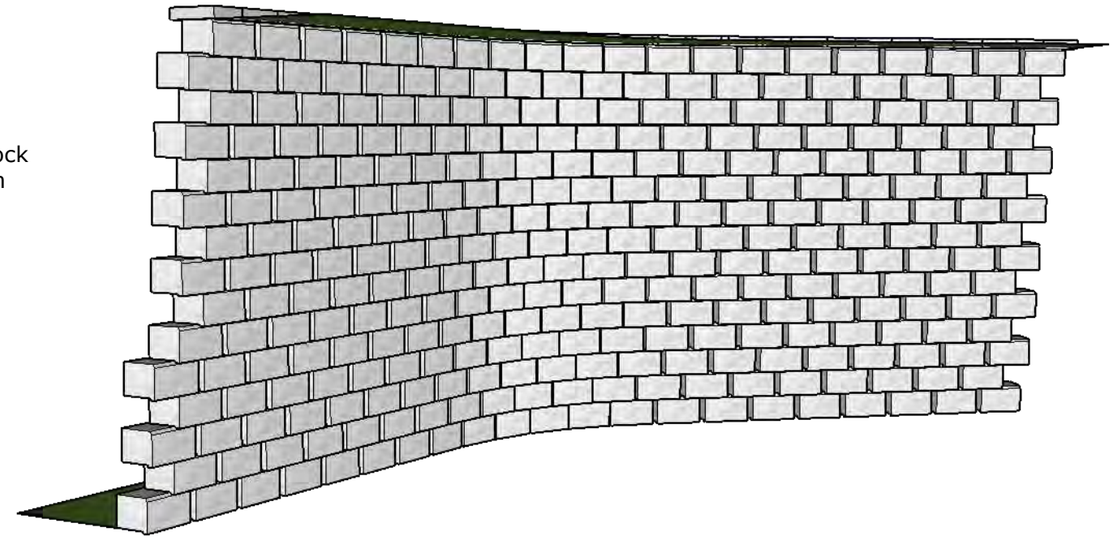
2- The concrete backfill must be pokered into the voids in and behind the Secura blocks to create a monolithic structure.

3- This detail is to only be implemented on walls that require NHBC approval OR where geogrid tails are not feasible.

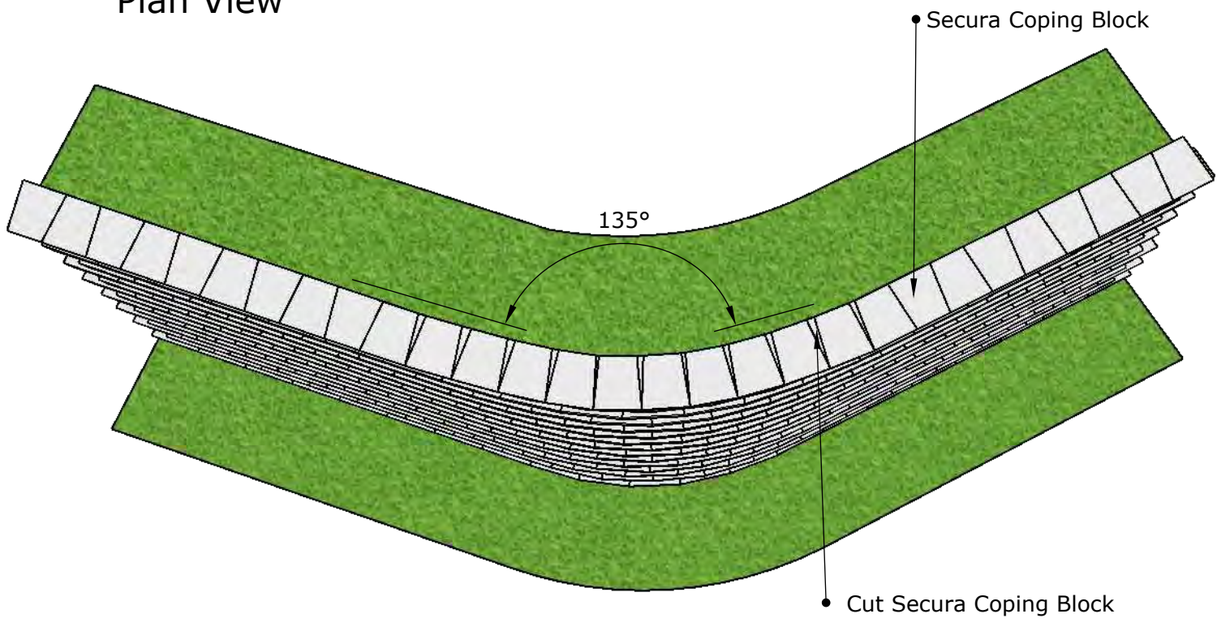
3D View Front



3D View Back



Plan View



External Curve Construction Notes:

External curved Secura Grand walls will taper inwards from the base course as the height increases due to the built-in 7 degree setback.

The table (Right) indicates the minimum radius which should be built for a given wall height. Failure to establish the correct radius at the base course will limit the height to which the wall can be built.

Prior to construction please review the installation guidelines available from www.Tobermore.co.uk

Wall Height (including base course) (H)	Minimum radius(to the back of the base course block) (R)
1.2m	2.00m
1.4m	2.03m
1.6m	2.07m
1.8m	2.10m
2.0m	2.15m
2.2m	2.20m
2.4m	2.30m
2.6m	2.35m
2.8m	2.40m
3.0 m	2.50m
3.2m	2.60m
3.4m	2.70m
3.6m	2.80m

Title: 3m, 135-degree External Curve

Ref: Secura Niche Details

Secura Grand Block

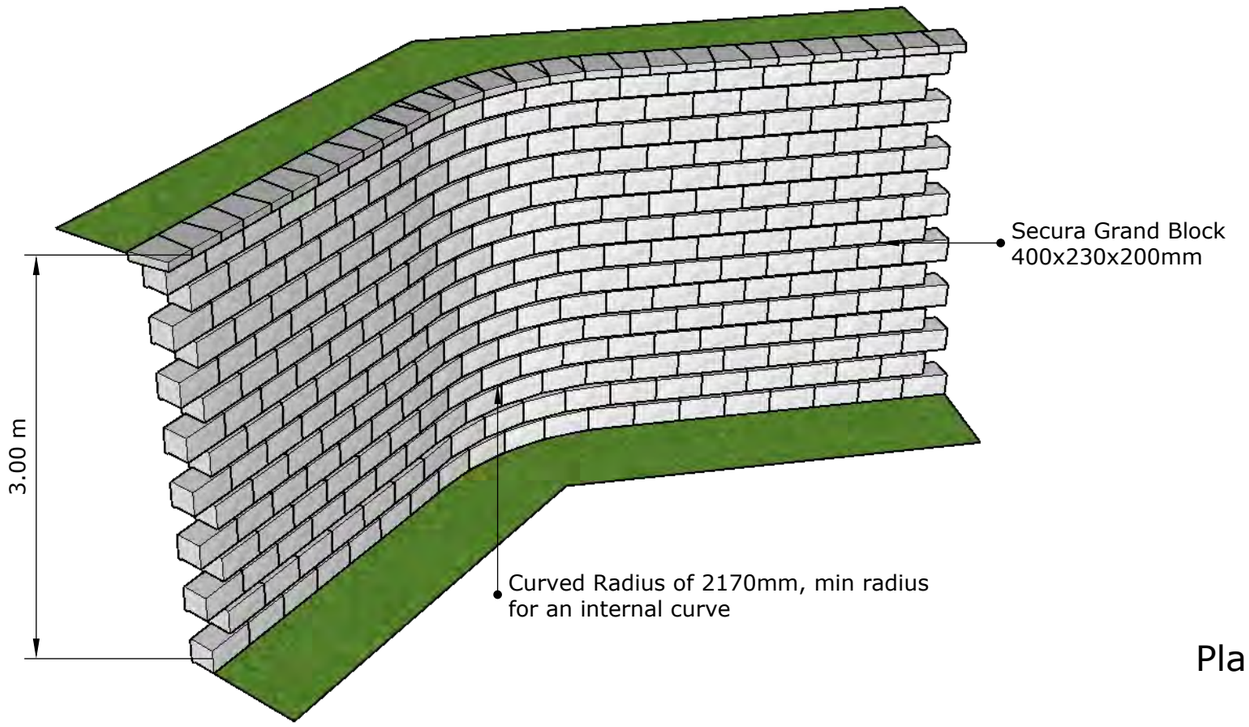
Secura Grand Corner Block

Secura Grand Cut Block

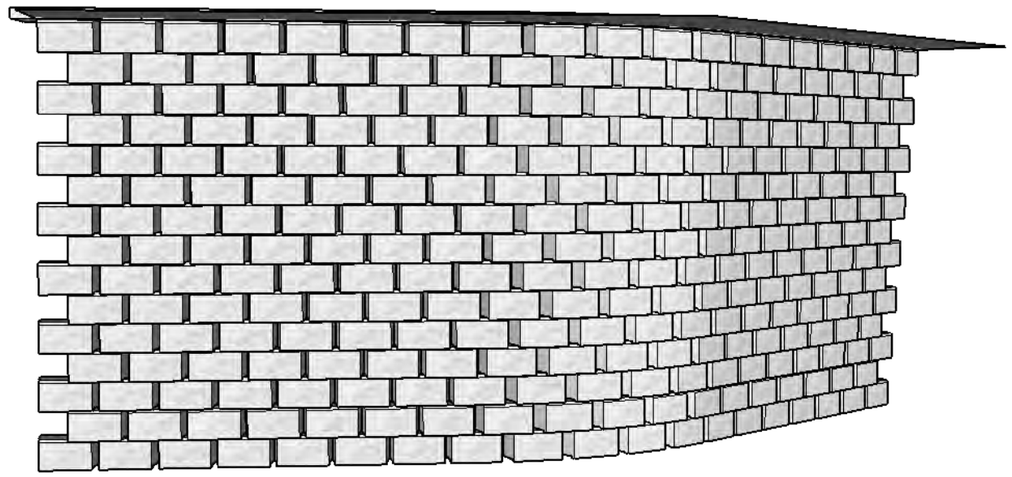
Secura Grand Coping

Tobermore

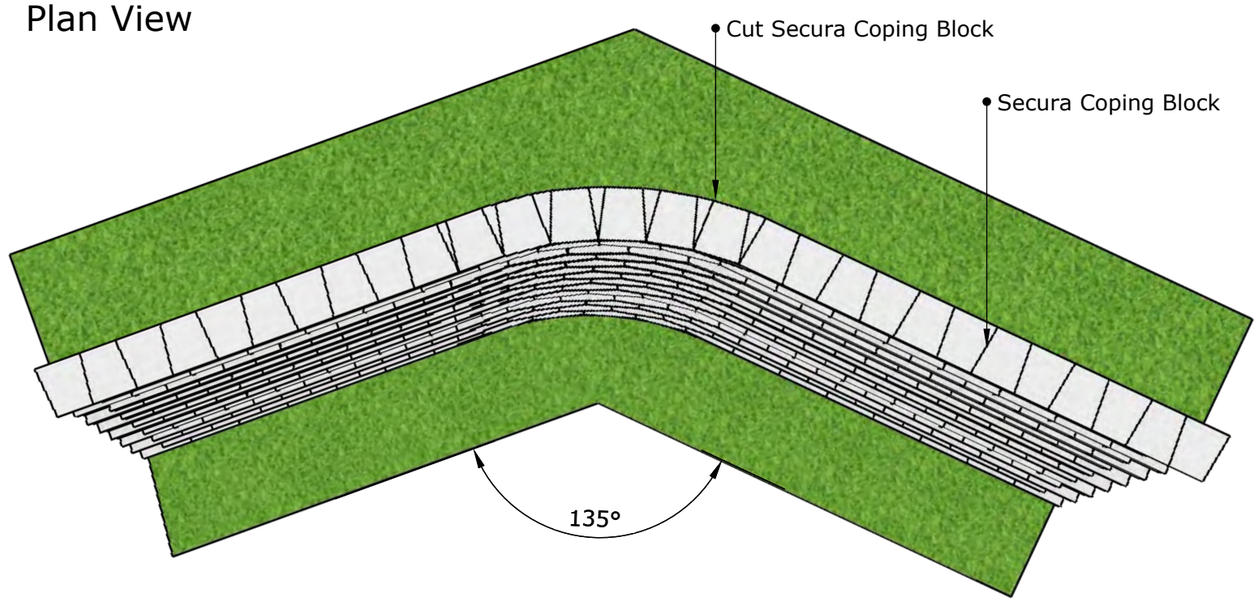
3D View Front



3D View Back



Plan View



Internal Curve Construction Notes:

Where possible, review the site plan to remove the tightest curves. The minimum radius possible for an internal curve on a Secura Grand wall is 2.4m, when measured to the back of the base course blocks (2.17m to the front of the block).

When laying curved walls the installer must be aware that the running bond will become offset from the half-lapped position as the wall increases in height.

Every effort should be made to avoid the bond overlap falling below 100mm.

Prior to construction please review the installation guidelines available from www.Tobermore.co.uk

Title: 3m, 135-degree Internal Curve

Ref: Secura Niche Details

Secura Grand Block

Secura Grand Corner Block

Secura Grand Cut Block

Secura Grand Coping

Tobermore

HAPAS

Tobermore Concrete Products Ltd
2 Lisnamuck Road
Tobermore
Co Londonderry BT45 5QF

Tel: 028 7964 2411 Fax: 028 7964 4145
e-mail: sales@tobermore.co.uk
website: www.tobermore.co.uk

BBA APPROVAL INSPECTION TESTING CERTIFICATION
TECHNICAL APPROVALS FOR CONSTRUCTION

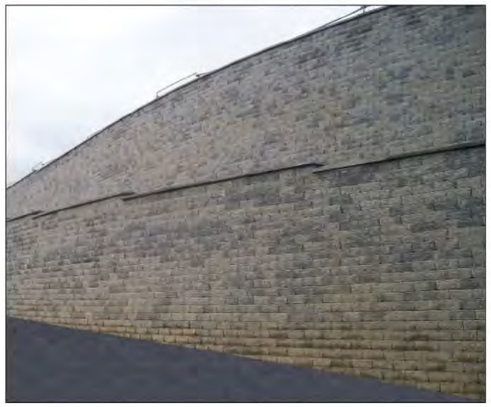
HAPAS Certificate
15/H230
Product Sheet 1

TOBERMORE RETAINING WALL SYSTEM

SECURA GRAND CONCRETE BLOCK WALL SYSTEM FOR REINFORCED SOIL RETAINING WALLS AND BRIDGE ABUTMENTS

This HAPAS Certificate Product Sheet(1) is issued by the British Board of Agrément (BBA), supported by National Highways (acting on behalf of the Overseeing Organisations of the Department for Transport; Transport Scotland; the Welsh Government and the Department for Infrastructure, Northern Ireland), the Association of Directors of Environment, Economy, Planning and Transport (ADEPT), the Local Government Technical Advisers Group and industry bodies. HAPAS Certificates are normally each subject to a review every three years.
(1) Hereinafter referred to as 'Certificate'.

This Certificate relates to the Secura Grand Concrete Block Wall System for reinforced soil retaining walls and bridge abutments, comprising modular concrete block facing units, Fortrac Geogrids, graded granular material and compacted fill. The system is used for the construction of reinforced soil retaining walls and bridge abutments up to a maximum height of 9 metres.



CERTIFICATION INCLUDES:

- factors relating to compliance with HAPAS requirements
- factors relating to compliance with Regulations where applicable
- independently verified technical specification
- assessment criteria and technical investigations
- design considerations
- installation guidance
- regular surveillance of production
- formal three-yearly review.

KEY FACTORS ASSESSED

Mechanical properties — the method of connection between the geogrids and concrete block facing units has been assessed and long-term connection strength values determined for various wall heights and concrete block/geogrid combinations. The interface shear capacity between adjacent concrete block facing units in between layers of geogrid reinforcement has been assessed and is satisfactory (see section 7).

Performance of geogrids — the short- and long-term tensile strength of the geogrids, resistance to installation damage, weathering and environmental effects, and soil/geogrid interaction have been assessed. Data and reduction factors for use in design are given in Certificate 13/H197, Product Sheet 1 (see section 7).

Durability — when designed and installed in accordance with the provisions of this Certificate, the system will have adequate durability for its intended use as a retaining wall or bridge abutment (see section 9).

The BBA has awarded this Certificate to the company named above for the system described herein. This system has been assessed by the BBA as being fit for its intended use provided it is installed, used and maintained as set out in this Certificate.

On behalf of the British Board of Agrement

Date of Third issue: 12 May 2022

Hardy Giesler
Chief Executive Officer

Originally certificated on 18 March 2015

British Board of Agrément
Bucknalls Lane
Watford
Herts WD25 9BA
©2022
tel: 01923 665300
clientservices@bbacerts.co.uk
www.bbacerts.co.uk

Securely Engineered

3X LOCK

Secura benefits from a three-way lock which provides connections through the wall for exceptional structural stability.

1. Aggregate Action

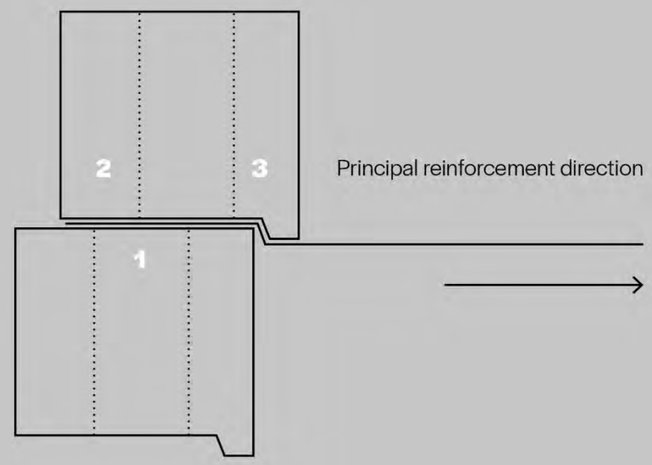
The granular aggregate fill in the hollow core of the Secura Grand blocks plays an important role in the integrity of the wall. Interaction between the geogrid and the aggregate acts as a lock, resisting movement.

2. Friction Lock

Under loading, the geogrid's ribbed texture grips the coarse surface of the Secura block creating friction to further resist movement.

3. Nib Lock

Secura's rear retaining nib, which effectively resists forward movement of the block, also acts as a clamp when under load, maintaining the engagement with the geogrid.



Secura's geogrid reinforced wall design provides the perfect balance between performance, buildability and long-term durability.

Retaining Walls

Stockists & Displays

Need a small quantity of Secura Grand to finish your project?

Secura Grand is stocked across the UK at the following branches:

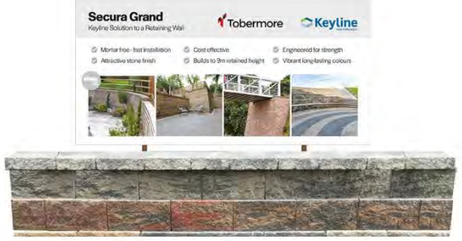
Secura Grand Stockists

Keyline Civils Specialists Branches	
Boxburn	Worcester
Newcastle	Swindon
Leeds	Exeter
Widnes	Canning Town
Norwich	Northampton
Nottingham	

EH Smith Branches
Shirley - Geogrid Only

Want to see Secura Grand & learn more?

Why not book a meeting with your Tobermore contact at a Secura Grand display? Secura Grand displays can be found the following branches:



Secura Grand Displays

Keyline Civils Specialists Branches	
Boxburn	Cardiff
Aberdeen	Treforest
Inverness	Swindon
Dundee	Exeter
Newcastle	Canning Town
Leeds	Norwich
Widnes	Northampton
Nottingham	Farnham
Worcester	Bodmin

Have a small, low height retaining wall to build?

Secura Lite is on display and stocked at across the UK at the following branches

Secura Lite Displays

Travis Perkins Specialists Branches			
Abercarn	Horwich	Mold	Salford
Bala	Hoylake	Morecambe	Southampton Park Gate
Birkenhead	Kendal	Oswestry	Stockport - Whitehall
Bishop Auckland	Leigh	Penrith	Stoke-On-Trent - Furlong Road
Burnopfield	Liverpool - Huyton	Petersfield	Swindon Dunbeath Road
Chester	Macclesfield	Porthmadog	Ulverston
Denbigh	Maidenhead	Queensferry	Warminster
Eccles	Milford Haven	Redditch	Wigan
Ferndown	Minworth	Sale	

Cartmore Building Supplies Branches
Fife

Secura Grand

Technical excellence lies at the core of the Secura segmental retaining wall system and Tobermore have engineered every aspect of its design to provide total assurance for the specifier. Secura's innovative segmental block format delivers many benefits in addition to its core functionality.

Why Secura Retaining Walls?

- Cost effective retaining wall product
- Quick to install
- Mortar-free installation
- Builds up to 9m retained height
- Engineered for strength
- Attractive stone finish with a range of colour options
- Vibrant long-lasting colours
- Full design and technical support available
- BBA HAPAS approved
- Can be combined with Geogrid to form reinforced soil walls for retaining structures

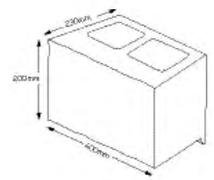
Colours, Size and Accreditation

Bracken

Heather

Slate

BBA APPROVAL INSPECTION TESTING CERTIFICATION
CERTIFICATE 15/H230
HAPAS



Disclaimer

The design of any retaining wall requires the input of an engineer to assess the unique conditions of every site in respect of loads in conjunction with site and soil conditions. The advice and typical wall designs included here are for information only to assist estimating and initial planning but should not be used for construction.

This document has been prepared based on the information provided by you. As such, this document is provided without liability on the part of Tobermore Concrete Products Limited (Tobermore) to the extent that any such information is inaccurate, incorrect, or incomplete.

You are strongly advised NOT to progress with construction as contemplated by this document until a detailed design drawing has been prepared by a qualified engineer or architect based on a detailed site survey. If the design contemplated in this document is constructed, this will be entirely at your own risk, and without liability on the part of Tobermore.

Tobermore does not exclude or limit in any way its liability to you where it would be unlawful to do so. This includes liability for death or personal injury caused by our negligence and for fraud or fraudulent misrepresentation. In all other respects, Tobermore excludes and/or limits its liability to the maximum possible extent permitted under applicable law. In no circumstances shall Tobermore be liable to you for any loss of profit, loss of business, business interruption, loss of business opportunity, or any indirect or consequential loss or damage whatsoever, arising under or in connection with this preliminary design, even if Tobermore was aware of the possibility that such loss or damage might be incurred by you.

Thank you for considering Tobermore, Secura Grand for your site.

Regards, Tobermore.

Appendix 5 – Road Restraint Risk Assessment

Queensberry
DESIGN LIMITED
RESIDENTIAL AND COMMERCIAL DESIGN CONSULTANTS

Keresforth Road, Barnsley

Road Restraint Risk Assessment

August 2024

Queensberry Design (Yorkshire) Ltd: Brookfield Court, Selby Road, Leeds, LS25 1NB

ISSUE SHEET

Prepared	Date		Checked	Date
ND	16.08.2024		RB	19.08.2024
-	First issue			19.08.2024

This document has been prepared solely as a Road Restraint Risk Assessment for Keepmoat Homes Limited regarding the proposed scheme at Keresforth Road. Queensberry Design Ltd accepts no responsibility or liability for any use that is made of this document other than by the Client for which it was originally commissioned and prepared. The risks identified at the time of writing are an opinion based on information available at the time and may not be exhaustive.

CONTENTS

APPENDICES

1. Introduction

1.1 Queensberry Design has been appointed to produce a Road Restraint Risk Assessment (RRRA) for the proposed development at Keresforth Road, Barnsley.

1.2 The development is at master planning stage and outline planning has been submitted to Barnsley Metropolitan Borough Council (BMBC) under reference 2022/0016.

1.3 Civil engineering appraisal has been carried out by Queensberry Design Ltd (QDL) consisting of an assessment of levels, earthwork and structures, which can be viewed within the QDL Road Crossing Design Assessment document.

1.4 The outcome of the civil engineering appraisal and options assessment has determined that a retaining wall will be required to provide a road crossing over the existing watercourse cutting through the site.

1.5 The purpose of this assessment is to a understand what mitigation may be required to prevent vehicles exiting the elevated road, or collision with proposed structures.

2. Site Characteristic

2.1 The assessment relates to an area within a large residential development, the site consists of a 5.5m conventional street with 2.0m footpaths.

2.2 The carriageway crosses a watercourse which is located at the base of a deep cutting (circa 5.0m) and will require retaining structures to cross the watercourse.

2.3 The alignment over the watercourse is straight, before the straight stretch the alignment curves with 65m (heading south) and 80m (heading north) centreline curves.

2.4 Approach gradient from the south is 1:24 falling towards the hazard and is within cutting, the approach gradient from the north is 1:15 as it above existing ground level.

2.5 Proposed cutting and embankments are at a gradient of 1:3.

2.6 The road surface on the approach to the hazard will be close graded asphalt concrete.

3. Appraisal Process

3.1 To determine whether a Road Restraint System is required CD 377 (DMRB) states that a RRRAP Assessment (Road Restraint Risk Assessment Process) should be carried out for each site/scheme to establish the need for a vehicle restraint and, if so, its performance requirements.

3.2 CD 377 is intended for use on roads with design speed or imposed speed limit of ≥ 50mph, reference CD 377 paragraph 2.2.

3.3 Where the design speed or imposed speed limit is <50mph the RRRAP is less applicable and the guidance given in the document "*Provision of Road Restraint Systems on Local Authority Road*" published by UK Roads Liaison Group and the Department of Transport should be used to assess of whether a Vehicle Restraint System (VRS) is required and the performance requirements associated.

3.4 The fundamental criteria to justify the road restraint system (RRS) is to establish if the risk level without a RRS is unacceptable, this is characterised into three categories using the principles of *As low as is reasonably practical* 'Broadly Acceptable', 'Tolerable' and 'Unacceptable'.

3.5 On applying an assessment, the site will be prioritised into one of three grouping as Table 5.2 within *Provision of Road Restraint Systems on Local Authority Road* provides the risk groupings, detailed below:

CATERGORY	RISK LEVEL	OUTCOMES
Higher Priority Site	Risk cannot be accepted safe in extraordinary circumstances	Where the risk assessment has defined a Site as Higher Priority the installation of an RRS is justified in terms of the level of risk. Further consideration is then required to determine if the site meets the other appraisal criteria. Even at high risk site non-RRS interventions may reduce the risk to a level where a RRS can be omitted.
Medium Priority Site	Intervention may be required to introduce control measures to drive residual risk towards the lower priority site category. The residual risk can be tolerated only if further risk reduction is impractical or requires action that is grossly disproportionate to the reduction in risk is achieved.	Where the risk evaluation has identified a site as medium priority a RRS may be justified however a non-RRS approach to reducing the risk may prove sufficient to negate the need for a RRS. If suitable effective measures cannot be introduced, then the appraisal process would normally continue in order to consider the other criteria.
Lower Priority Site	Level of risk regarded as generally acceptable. Further effort to reduce risk is not likely to be required as resources to reduce risk would be grossly disproportionate to risk reduction achieved	Where the risk evaluation identifies a site that is lower priority further appraisal is not required and the level of risk does not normally support installation of a RRS. Simple low-cost measures that could reduce the risk can still be considered.

Provision of Road Restraint Systems on Local Authority Road – Table 5.2 Site Risk Categories

3.6 Assessment methods available to appraise the site are as follows:

- Accident Assessment (A) – Only suitable for existing roads where accident data is available. This method is not suitable for Road/Rail interfaces and new construction.
- Network Rail Methodology (B) – This approach is only suitable where there is a road/rail interface.
- Risk Scoring (C) – This method is available for use on new routes where no accident data is available.

3.7 Based on this method (C) is applicable for this assessment

4. Alternatives to RRSs

4.1 Other measures can be introduced that would assist in reducing the risk of vehicles leaving the carriageway or encountering a hazard when they leave the carriageway, examples include:

- Removal of the roadside hazard
- Relocation of the hazard
- Replacement with passively safe street furniture
- Resurfacing or treatment of the carriageway to reduce the skid risk
- Speed control measures
- Re-alignment of the carriageway
- Installation of chevron and warning sings, including vehicle activated signs
- Installation of bollards

5. Risk Scoring

5.1 The risk scoring method has been determined as the appropriate method of appraising the site, factors will be given a priority rank in order to achieve a risk category and outcome as table 5.2 of *Provision of Road Restraint Systems on Local Authority Road*

Hazard Category

5.2 This step is used to assess whether certain scenarios where the risk can be assumed to be sufficiently high to justify further appraisal is applicable. These scenarios are where there is a realistic possibility of a vehicle leaving the carriageway and reaching one of the following features:

- Public building
- Place of regular congregation (e.g. outside a school)
- Office block/place of work
- Large block of flats
- Playground/open sports area

Location factor

5.3 The level of risk present will vary based on the type of route, the speed limit as well as the amount and make up of traffic on the route. The location factor collectively considers all these issues and acts as a proxy for the probability of a vehicle leaving the carriageway and results in a risk score that represents the nature of the road adjacent to the hazard.

5.4 Table 1 provides a route rank and risk factor score; the site is viewed as 'all other roads':

PRIORITY RANK	RISK FACTOR SCORE
0 – All other roads	0
1 – Rural U & B roads and urban C roads	1
2 – Rural A road and urban B road	3
3 – Urban A road	6

Table 1 – Route rank

Layout factor

5.5 The layout of the carriageway can increase the likelihood of a vehicle encountering the roadside hazard, table 2.10 of CD 109 (DMRB) is relevant for horizontal curvature which the carriageway geometry has been assessed against in table 2.

PRIORITY RANK	RISK FACTOR SCORE
0 – Straight alignment and/or complies with CD 109	0
1 – One step below desirable minimum R with superelevation of 5%	1
2 – Two steps below desirable minimum R with superelevation of 5%	2
3 – Three steps below desirable minimum R with superelevation of 5%	3
4 – Four steps below desirable minimum R with superelevation of 5%	4
5 – Five steps below desirable minimum R with superelevation of 5%	5

Table 2 – Layout factor part 1

5.6 The second factor to consider is the complexity of the carriageway layout, in the instance of the site on manoeuvres or lane changes are expected.

PRIORITY RANK	RISK FACTOR SCORE
0 – No reason for lane changing/manoeuvres	0
1 – Some potential for lane changing, overtaking, positioning manoeuvres, or avoiding action	2
2 – High likelihood of lane changing, overtaking, positioning manoeuvres, or avoiding action	3

Table 3 – Layout factor part 2

Collison factors

5.7 Potential hazards are to be assessed and ranked in priority as table 4, in the case of the site there is a longitudinal hazard consisting of the embankment and retaining structure adjacent to the carriageway.

PRIORITY RANK	RISK FACTOR SCORE
0 – Individual spot hazard	0
1 – Series of individual hazards less than 50m apart or a longitudinal hazard that may be reached	1
2 – Longitudinal hazard that is highly likely to be reached resulting in harm or a spot hazard downstream if a feature which may guide the vehicle towards the hazard.	2

Table 4 – Collison factor part 1

5.8 The percentage severity of the possible impact should be considered using the national percentage KSI data, in the instance of this site the percentage of KSI is considered to be > 30%.

PRIORITY RANK	RISK FACTOR SCORE
0 – Percentage of KSI for primary hazard < 20%	0
1 – Percentage of KSI for primary hazard 20 - 30%	1
2 – Percentage of KSI for primary hazard > 30%	2

Table 5 – Collison factor part 2

Consequential factors

5.9 Consequential factors consisting of secondary incidents, network disruption and cost of damage are to be considered.

PRIORITY RANK	RISK FACTOR SCORE
0 – No secondary events likely	0
1 – When damaged or collapsed the feature could give rise to the risk of secondary vehicular accidents	1

Table 6 – Consequential Factor part 1

5.10 Should an incident arise no network disruption is expected as access can be gained via different routes

PRIORITY RANK	RISK FACTOR SCORE
0 – No impact on network availability	0
1 – If hazardous feature was damaged or collapsed this could give rise to network disruption for more than one day	1

Table 7 – Consequential Factor part 2

5.11 No significant cost of repair is expected

PRIORITY RANK	RISK FACTOR SCORE
0 – No significant cost implications	0
1 – Significant cost of repair or replacement following collision	1

Table 8 – Consequential Factor part 2

Risk ranking score

5.12 The risk ranking score is based on the addition of 4 different factors (F) which is to be used to review the site:

FLOCATION (Range 0-6) **= 0**

FLAYOUT (Largest of two score, Range 0-5 or 0-3) **= 3**

FCOLLISION (Sum of two separate scores, Range 0-4) **= 4**

FCONSEQUENTIAL (Sum of three separate scores, Range 0-3) **= 2**

5.13 This has determined the total risk score of **9** and therefore a medium priority based on table 5.2 of *Provision of Road Restraint Systems on Local Authority Roads.*

TOTAL RISK SCORE	CATEGORY	OUTCOME
14 or more	Higher Priority	
9 – 13	Medium Priority	Where the risk evaluation has identified a site as medium priority a RRS may be justified however a non-RRS approach to reducing the risk may prove sufficient to negate the need for an RRS. If suitable effective measures cannot be introduced, then the appraisal process would normally continue to consider the other criteria.
0 – 8	Lower Priority	Where the risk evaluation identifies a site that is lower priority further appraisal is not required and the level of risk does not normally support installation of an RRS. Simple low cost measures that could reduce the risk can still be considered

Table 9 – Resultant Risk Categories

6. Risk Mitigation

6.1 The site has been assessed as a medium priority site, therefore a RRS may be justified however a non-RRS approach to reducing the risk may provide sufficient to reduce risk.

Mitigation Solutions

6.2 As the carriageway falls towards the watercourse and retaining wall, the provision of methods to prevent vehicles exiting the carriageway should be implemented.

6.3 The primary incidents which could occur. Are either a vehicle leaving the carriageway and striking the retaining structure or a vehicle exiting the road on the southbound approach and then passing down the embankment towards the woodland/watercourse.

6.4 Both instances as this assessment are not a high risk.

6.5 Injury to vehicle occupiers cannot be discounted and, costly damage to the retaining wall is possible, likewise damage could occur to protected trees.

6.6 It is therefore, proposed to install containment kerbing (Trief kerb or similar) along the road alignment next to the retaining structure and on the downhill gradient when the road is in fill.

6.7 It is not deemed necessary to provide containment kerbing when the road is within cut.

6.8 The inclusion of robust reflective bollards/hazard markers on the offside radii when approaching the hazard is also proposed to provide a further visual warning that a bend and potential risk is approaching.

6.9 Given this risk assessment is primarily against a 1:3 embankment or retaining wall which would need to be greater than 6m high to be considered critical under a RRRAP earthworks assessment, it is thought the above measures shall offer suitable mitigation.

6.10 The discussed proposals are provided in appendix 2.

Appendix 1 – Site Characteristics

GRASS EMBANKMENT MAX. GRADIENT 1:3

WATERCOURSE

REDLINE BOUNDARY

WOODLAND

11.5 DOWN GRADIENT >>

2.0m

5.5m

2.0m

GRASS EMBANKMENT MAX. GRADIENT 1:3

R65.0m CENTRE LINE

PROPOSED RETAINING STRUCTURE

WOODLAND

WATERCOURSE

GRASS CUTTING MAX. GRADIENT 1:3

2.0m

NEW 'CONVENTIONAL STREET' 20mph

5.5m

2.0m

R80.0m CENTRE LINE

<< 12.4 DOWN GRADIENT

GRASS CUTTING MAX. GRADIENT 1:3

Rev.	Date	Revision Details	Drawn	Checked
P01	19.08.24	FIRST ISSUE	ND	

QUEENSBERRY DESIGN
CIVIL, STRUCTURAL, ARCHITECTURAL & GEOTECHNICAL CONSULTANTS
QUEENSBERRY DESIGN YORKSHIRE LTD
SUITE 12A, BROOKFIELD COURT, SELBY ROAD, LEEDS, LS25 1NB
T: 0113 517 7099
www.queensberrydesign.co.uk

Client: KEEPMOAT HOMES

Project: KERESFORTH ROAD
DODWORTH
BARNSLEY

Title: SITE CHARACTERISTICS

Drawn	Checked	Date
ND		16.08.2024

Drawing Number: 0010-QD-XX-S-DR-C-00-21

Drawing Status	Scale	Rev.
INFORMATION	1:500 - A1	P01

Appendix 2 – Mitigation

Only PDF/ DWF Issues of this drawing are controlled. All other formats (eg. DWG AutoCAD FILES) are UN-controlled and are used at your own risk.

Rev.	Date	Revision Details	Drawn	Checked
P01	19.08.24	FIRST ISSUE	ND	

QUEENSBERRY DESIGN
CIVIL, STRUCTURAL, ARCHITECTURAL & GEOTECHNICAL CONSULTANTS

QUEENSBERRY DESIGN YORKSHIRE LTD
SUITE 12A, BROOKFIELD COURT, SELBY ROAD, LEEDS, LS25 1NB
T: 0113 517 7099
www.queensberrydesign.co.uk

Client
KEEPMOAT HOMES

Project
KERESFORTH ROAD
DODWORTH
BARNSLEY

Title
SITE MITIGATION

Drawn	Checked	Date
ND		16.08.2024

Drawing Number
0010-QD-XX-S-DR-C-00-22

Drawing Status	Scale	Rev.
INFORMATION	1:500 - A1	P01

Appendix 6 – DMRB CG 300

Design Manual for Roads and Bridges

Highway Structures & Bridges
General Information

CG 300
Technical approval of highway structures

(formerly BD 2/12)

Version 0.1.0

Summary
Former DMRB document BD 2/12 has been amended as follows to form this document: *Amended clauses and model AIP to include Principal Designer, which is stipulated in Construction (Design and Management) Regulations 2015 *Added provisions for structures options reports.*Clause 2.29.7 added 'Water management' as a specific aspect for assessment.*Clauses 3.5 - 3.12 have alterations to some height/span ranges for some structures following feedback.*Added Type N classification to temporary works section to reflect provisions within PAS 8811 (see references).*Amended procedure to require Designer to agree design or assessment criteria within AIP with checker prior to submission to TAA.* Requirements included to identify safety critical fixings.*Updates to model forms.

Application by Overseeing Organisations
Any specific requirements for Overseeing Organisations alternative or supplementary to those given in this document are given in National Application Annexes to this document.

Feedback and Enquiries
Users of this document are encouraged to raise any enquiries and/or provide feedback on the content and usage of this document to the dedicated Highways England team. The email address for all enquiries and feedback is: Standards_Enquiries@highwaysengland.co.uk

This is a controlled document.

Contents

Latest release notes

Document code	Version number	Date of publication of relevant change	Changes made to	Type of change
CG 300	0.**1**.0	April 2021	Core document, England NAA	Incremental change to requirements
Various changes and amendments for clarity and administration purposes. No technical changes.				

Previous versions

Document code	Version number	Date of publication of relevant change	Changes made to	Type of change
CG 300	0	March 2020		

Foreword

Publishing information

This document is published by Highways England

This document supersedes BD 2/12, which is withdrawn.

Contractual and legal considerations

This document forms part of the works specification. It does not purport to include all the necessary provisions of a contract. Users are responsible for applying all appropriate documents applicable to their contract.

Introduction

Background

This document specifies the technical approval (TA) procedures for highway structures on motorways, trunk roads or any road designated by the Overseeing Organisation.

In the early 1970s, structure failures at Yarra (Australia), Milford Haven (Pembrokeshire, Wales), Koblenz (Germany) and over the Danube (Austria) occurred during erection. Resulting from these failures and the subsequent Merrison Report [Ref 2.I], the following important changes were made by the then Ministry of Transport:

1) the Department would continue to examine design criteria and methods but not computations;
2) the requirements by the Department for a certificate of independent check of the design and computations; and,
3) the application of approval in principle (AIP) stage to all but minor structures, which would cover the selection of bridge type, the materials for its construction and methods of analysis and design to be adopted.

The TA procedures as described in this document generally require the proposer to submit an AIP to the Checker for agreement prior to submission to the Overseeing Organisation and to receive endorsement of the AIP before proceeding with any design or assessment. The completed design or assessment cannot be implemented until the Overseeing Organisation is in receipt of certified confirmation that the implementation documents are accurate and fully in compliance with the requirements of the AIP. TA procedures for proprietary manufactured structures and products are also covered in this document.

The TA procedural requirements impose a discipline on the process that encourages good practice and should reduce the possibility of errors affecting structural fitness for purpose. Most importantly however, the procedures minimise the possible risks to highway users and others who are being affected. The procedures can be applied to any other circumstances where the highway authority considers the requirements to be appropriate.

The fundamental objectives of the TA procedures are to give increased assurance for the required execution, refurbishment or demolition of highway structures. This will help ensure that the proposals are safe to implement, that any new structures procured are serviceable in use, economic to build and maintain, comply with the objectives of sustainability, have due regard for the environment and that they satisfactorily perform their intended functions. The TA procedures also ensure, as far as reasonably practicable, that highway users, the public and any others who may be affected are protected from adverse effects resulting from any work carried out to any highway structure.

Assumptions made in the preparation of this document

The assumptions made in GG 101 [Ref 9.N] apply to this document.

Mutual Recognition

Where there is a requirement in this document for compliance with any part of a "British Standard" or other technical specification, that requirement can be met by compliance with the mutual recognition clause in GG 101 [Ref 9.N].

Abbreviations

Abbreviations

Abbreviation	Definition
AIP	Approval in principle
CEng	Chartered Engineer
CPR	Construction Products Regulations
EOTA	European Organisation for Technical Approvals
ETA	European Technical Approval
M&E	Mechanical and electrical
MICE	Member of the Institution of Civil Engineers
MIStructE	Member of the Institution of Structural Engineers
O/AIP	Outline approval in principle
TA	Technical approval
TAA	Technical approval authority
TAS	Technical approval schedule
TDA	Tunnel design authority
TDSCG	Tunnel design and safety consultation group

Terms and definitions

Terms

Term	Definition
All lane running	England only term for a smart motorway which includes the permanent conversion of a hard shoulder to a running lane
Approval in principle	the document, which records the agreed basis and criteria for the detailed design or assessment of a highway structure
Assessment team	the group of engineers responsible for the assessment. It may comprise an appropriate mix of specialists under the direction of a team leader.
Assessor	the organisation responsible for the overall assessment
Buildability	the extent to which the design facilitates ease and safety of construction, allowing the most efficient and economic use of resources, subject to the overall requirements for the completed project
Category	the classification of the proposals, which determines the need for AIP, the form of check to be applied and the certificates to be prepared
CE marking	the marking that the manufacturer applies to declare compliance of a product with relevant EU product regulations including the Construction Products Regulation (CPR) 305/2011/EU [Ref 2.N]
Checker	the organisation responsible for the independent check of the design or assessment
Check team	the group of engineers responsible for the independent check of the design or assessment. It may comprise an appropriate mix of specialists under the direction of a check team leader.
Construction compliance	confirmation that the execution works undertaken are in compliance with the agreed documents (such as AIP, design, specification, drawings, etc.)
Contractor	the organisation contracted by the Overseeing Organisation to undertake execution works on its behalf. Also known as Principal Contractor
Contractor's representative	a representative of the Contractor, with responsibility for overseeing the execution works
Departure	criterion, which departs from, or is an aspect not covered by, the standards contained in, the technical approval schedule
Designer	the organisation responsible for the overall design or assessment. Also known as Principal Designer

Terms (continued)

Term	Definition
Design team	the group of engineers responsible for the design. It may comprise an appropriate mix of specialists under the direction of a design team leader
Eurocodes	as defined in BS EN 1990 [Ref 7.N]
Execution	as defined in BS EN 1990 [Ref 7.N]
Foundation	generally in a highway structure, that part of the substructure in direct contact with, and transmitting load to, the ground. Note: Specific elements forming the foundation are to be given in the AIP
Ground investigation report	a report that contains geotechnical information relevant to the design or assessment. See CD 622 [Ref 10.N]
Highway boundary	limits of the highway that are the responsibility of the Overseeing Organisation. This includes the road, footpaths, verges, slopes, etc. within those limits
Highway structure	structure or installation coming within the scope of this document and situated under, over or adjacent to a motorway or other trunk road or road designated by the Overseeing Organisation
Lighting column system	range of combinations of column heights and lengths of brackets together with the weights and windage areas of lanterns and attachments for which the column has been designed
Maintaining agent	the organisation with delegated responsibility for the maintenance of a highway structure
Outline approval in principle	the document, which records the agreed basis and outline criteria for the detailed design of a highway structure
Overseeing Organisation	this refers to the following organisations (or their successors): Highways England; Transport Scotland; Welsh Government (Llywodraeth Cymru) and The Department for Infrastructure (Northern Ireland). Additionally, it will refer to any other organisation that chooses to use this document for technical approval.
Principal	a senior representative of the designer, assessor, checker, contractor or works examiner having authority to sign certificates on its behalf
Principal Contractor	the organisation or individual appointed by the client to plan, manage and monitor and coordinate the construction phase of work where there is more than one contractor
Principal Designer	the organisation or individual appointed by the client to plan, manage and monitor the pre-construction phase, and where appropriate liaise with the principal contractor during the construction phase

Terms (continued)

Term	Definition
Project manager of the Overseeing Organisation	representative of the Overseeing Organisation with responsibility for project management of execution works to highway structures
Proposal	the proposal relating to the design or assessment of a highway structure including the mechanical and electrical (M&E) installations covered by this document
Proprietary manufactured structure or products	a structure with CE marking or product with CE marking manufactured to a system covered by a patent and/or a registered design
Road tunnel	a subsurface highway structure enclosed for a length of 1 50 m or more
Safety critical fixing	application in which the failure of a post-installed reinforcement or anchor can: 1) result in the collapse or partial collapse of the structure; 2) cause risk to human life; or, 3) lead to significant economic loss
Service tunnel	a tunnel structure installed by trenchless technology beneath a highway for any purpose. This can be regarded as a service crossing if the internal diameter is 2m or less
Structure resilience	the ability of structure to resist deliberate damage which may arise from the actions of vandals, thieves and terrorists
Structure robustness	the ability of a structure not to be damaged disproportionately in the event of accident, misuse or deterioration
Substructure	generally in a highway structure, the wing walls, piers, columns, towers and abutments that support the superstructure Note: Specific elements forming the substructure are to be given in the AIP.
Superstructure	generally in a highway structure, that part of the structure which is supported by the piers, columns and abutments. Note: Specific elements forming the superstructure are to be given in the AIP
Team leader	the person responsible for overseeing and co-coordinating the work of the design, assessment or check team and having authority to sign on behalf of the team. The team leader is to be appropriately qualified and competent in relevant fields of engineering related to the work and is to be a chartered member of a relevant institution or suitable equivalent.

Terms (continued)

Term	Definition
Technical approval	the submission of proposals for agreement by the technical approval authority and the subsequent provision and acceptance of certificates confirming that the design, assessment, specification or construction works complies with the agreed approval in principle and design/assessment and specification certificates as appropriate
Technical approval authority	the organisation responsible for agreeing the approval in principle and subsequently accepting the relevant certificates
Technical approval schedule	the schedule of documents to be used for the design or assessment of a highway structure
Third party	any person, organisation or other legal identity that is not employed directly or indirectly by the Overseeing Organisation
Tunnel Design Authority (TDA)	A central high level governance group - As ENAA for CD 352 [Ref 1.I]
UK national standards (Eurocodes)	the suite of Eurocodes to be implemented by BSI as UK national standards, covering structural design of all civil engineering works, including bridges
UK national standards (non-Eurocodes)	British Standards that, prior to being replaced by UK national standards (Eurocodes), were used for the design of highway structures or British Standards that apply to aspects not covered by Eurocodes
Works Examiner	the organisation nominated in the contract to undertake independent examination of the execution, commissioning (of M&E) or testing of works carried out by the Contractor

1. Scope

Aspects covered

1.1 Subject to any exclusions expressly stated in this document, technical approval (TA) procedures shall be applied to all proposals, including third party proposals and private developments, that are:

1) within the highway boundary;
2) outside the highway boundary, where the structures are to be adopted by the Overseeing Organisation;
3) outside the highway boundary where works can affect the highway or highway structure; and,
4) outside the highway boundary where works can affect the safety of the highway user.

NOTE *Proposals can relate to construction, widening, assessment, improvement, repair (where structural integrity is implicated), and demolition.*

1.2 The scope of TA shall be in accordance with Sections 3 to 6 of this document.

1.2.1 In cases where the design and construction of a third party proposal for temporary works or temporary structures are outside the competence of the Overseeing Organisation, the special requirements given in respective National Annexes may be implemented.

1.3 TA procedures shall apply to temporary works where the permanent works proposal has identified the need for an independent check.

1.4 TA procedures shall not apply where there are no public safety issues.

NOTE *Temporary work in green field sites or works within the highway boundary where there will be no interface with the public are examples of works where there are no public safety issues.*

Contractual responsibilities and procedure

1.5 TA shall not in any way modify or reduce the contractual and statutory responsibilities of any party for the work carried out or the legal responsibilities of professional engineers.

NOTE *This document is written such that it is applicable in principle to all current and likely future forms of procurement (refer to respective National Annexes for exceptions).*

1.6 Where departing from the procedures, format or terms used in this document, the Designer/Assessor shall ensure that the following objectives are achieved:

1) the required design or assessment principles are formally agreed prior to award of any contract; and,
2) execution of the works is not allowed to proceed until there is formal agreement to a comprehensive submission of the design or assessment principles in accordance with the requirements of this document.

NOTE *Formal agreement of design or assessment principles can avoid contractual repercussions.*

1.7 The model AIP forms and certificates provided in the appendices shall be amended and agreed with the Overseeing Organisation, to suit specific contract requirements.

1.8 Timings and procedures shall be identified in the scheme specific contract requirements.

NOTE *It is recommended to consult the TAA in advance to agree timings and include these in the works programme.*

1.9 The contract requirements shall clarify whether the proposals and the AIP are of an outline nature or whether they are comprehensive and sufficient for detailed design or assessment.

NOTE 1 *Outline proposals are sufficient for the invitation or acceptance of tenders.*

NOTE 2 *For detailed design, the principles, detailed requirements and recommendations of this document apply .*

1.9.1 The TAA should be consulted to agree the TA procedures where there are any uncertainties with regard to procurement.

NOTE *For example, TA for the design can typically be completed in detail before tender; in other forms of procurement where design and the TA process is incomplete prior to inviting tenders, submission of a final detailed AIP can take place following award of contract.*

Implementation

1.10 This document shall be implemented forthwith on all schemes involving the assessment, design, execution, operation and maintenance of highway structures on the Overseeing Organisations' motorway and all-purpose trunk roads according to the implementation requirements of GG 101 [Ref 9.N].

1.11 This document shall be used to implement the procedures for private development within the highway boundary.

Use of GG 101

1.12 The requirements contained in GG 101 [Ref 9.N] shall be followed in respect of activities covered by this document.

2. General requirements and principles

Overseeing Organisation's requirements

2.1 Technical requirements for the design, execution, operation and maintenance, decommissioning and demolition of highway structures shall be contained in the technical approval schedule (TAS).

2.1.1 In some forms of contract, such as design and construct, technical requirements may be contained in the contract requirements.

NOTE *The TAs includes the DMRB, the British Standards (including Eurocodes, National Annexes and Published Documents), MCHW and other supplementary standards for specific projects requirements.*

2.2 All submissions shall be in an agreed electronic format in accordance with the Overseeing Organisations' requirements, unless set out otherwise in contract documents.

2.3 The format selected shall allow the Designer, Checker and TAA to review all information and, when required, attach unique electronic signatures.

2.4 Third party proposals covered in Section 1 shall be dealt with as follows:

1) the principles given for the TA procedures in this document are adopted;
2) the TAA does not take on the responsibility that belongs to the third party;
3) the principles of special requirements given in the respective NAAs are applied where the Overseeing Organisation does not have a specific competence or expertise to give an opinion on whether the third party proposal or temporary works are safe or not; and,
4) for third party proposal of temporary work or temporary structure, Section 4 of this document is to be followed.

NOTE *Third party proposals includes any from adjacent landowners, statutory undertakers, private developers, government bodies, etc.*

Proprietary manufactured structures and products

2.5 Proprietary manufactured structures and products shall be subject to the full TA procedures, with the exception of those that comply with the requirements of the Construction Products Regulations (CPR) 305/2011/EU [Ref 2.N].

2.6 Proprietary manufactured structures and products shall be used for their intended purpose.

NOTE 1 *An essential consideration for adoption of proprietary manufactured structures or products is the avoidance of discrimination against any structure or product that has the required declared performance either under a CE mark applied in compliance with the CPR or a recognised product registration system and would satisfy the specified end use.*

NOTE 2 *Any discrimination that does create a "barrier to trade" is in contravention of European Community legislation. The procedures are to avoid two forms of discrimination in particular: (a) discrimination between different forms of construction or product that will satisfy the same end use, and (b) discrimination between directly competing proprietary systems or products.*

2.7 Proprietary manufactured structures or products with CE marking in accordance with CPR procedures shall be accepted for their correct intended use and satisfy the specified performance requirements.

2.8 The TA procedures shall not be applied to any aspect related to this acceptance except to confirm that the declared performance of the product meets that required.

2.9 Additional requirements must not be imposed on manufactured structures with CE markings or products with CE markings that are used for their intended use.

2.10 Where there are potential safety issues with the use of manufactured structures with CE markings or products with CE markings, TAA shall be consulted.

2.11 TA procedures shall apply for installation of CE marked structures or products, but not their manufacture.

2.12 TA procedures shall apply where unintended use is proposed for CE marked structures or products.

NOTE *Further information is given in 3.12(6) and Appendix P.*

Use of UK National Standards

2.13 For the design of highway structures using UK National Standards (Eurocodes), reference shall be made to the Overseeing Organisations' current requirements for the use of Eurocodes for the design of highway structures.

2.14 For the design of highway structures using UK National Standards (Eurocodes), the model AIP form in Appendix A shall be used.

2.15 For the design or assessment of highway structures using UK National Standards (non-Eurocodes), the model AIP form in Appendix B shall be used.

NOTE *Model forms are intended to be generic and can be enhanced and edited to suit particular proposals as required.*

Options report

2.16 An options report shall be submitted for all works listed below, unless indicated otherwise by the Overseeing Organisation:

1) where there are a number of realistic cost effective alternatives for permanent structures expected to be category 2 or 3 (as described in Sections 3 to 6 of this document);
2) for structures to be category 0 or 1 with an estimated construction cost in excess of £0.5M; and,
3) where directed.

2.17 The options report shall be prepared by the Designer.

2.18 The format, content and level of detail of the options report shall be as agreed with the Overseeing Organisation.

NOTE 1 *Guidance is provided in Appendix O.*

NOTE 2 *It is intended that the options are limited to the primary alternatives rather than numerous iterations of similar or unrealistic options. Typically, the option report sets out possible alternative structure solutions considering factors such as complexity, buildability, durability, risk, programme, cost, etc..*

2.19 An options report for assessment shall not be required, unless this has been included as an alternative to new work options above.

Category of proposals

2.20 The proposals shall be placed in one of four categories: 0, 1, 2 or 3, according to the criteria described in Sections 3 to 6.

2.21 The category from clause 2.20 shall be proposed by the Designer or Assessor and details of the proposal submitted to the TAA for agreement.

2.21.1 The Designer or Assessor may undertake an initial screening process with the TAA to obtain an early agreement on the category.

NOTE *The category boundaries are not rigid and the category of each proposal is decided on its merits, having regard to potential consequences of failure, design complexity and whole life costs.*

2.22 AIP's shall be required for categories 1, 2 and 3.

NOTE *AIP's are not required for category 0.*

2.22.1 Where TA agrees that the AIP does not add value, it may be omitted for category 1 and 2.

2.23 Where a structure has been placed in category 0 or 1 and a proposal arises subsequently requiring a departure, the TAA shall be contacted to request a review of the category.

2.23.1 Typically a change to category 2 will be required, but if the TAA considers that the Departure has little or no structural implication, then a change of category may not be necessary.

2.24 Where the TAA has reviewed the category and agreed to retain category 0, a new certificate shall be submitted making reference to the approved departure from standard.

2.25 Where the TAA has reviewed the category and agreed to retain category 1, an amendment or addendum to the AIP shall be submitted.

2.26 The agreement of the TAA shall be required before any proposal that includes a departure can be incorporated in the design or assessment.

Proposals

Proposals for categories

2.27 Proposals for categories 1, 2 and 3 shall provide the following:

1) provide sufficient information and evidence to demonstrate compliance with the Overseeing Organisation's requirements and to justify their viability;
2) identify, assess and take into account, through appropriate methods of risk management, potential risks and hazards during the whole life of the structure such as execution, operation, maintenance and demolition, with a view to eliminating or minimising these risks;
3) list in the AIP only risks and hazards that would not be apparent to an experienced and competent contractor or are likely to require special attention to manage them effectively;
4) provide evidence that appropriate consultation has taken place with all relevant stakeholders, and that full and proper consideration has been given to their respective interests;
5) identify, assess and consider risks and hazards that can affect the structure as a result of other stakeholders' requirements (such as leakage of gas or water mains);
6) identify, assess and take into account risks and hazards posed by the structure to other infrastructure belonging to a third party;
7) include documentation relating to consultation and special requirements of those consulted within the AIP;
8) describe the information that is available concerning existing records and assumptions made regarding the interpretation of available data that will be relevant to the design or assessment; and,
9) list in the TAS all relevant documents that are being proposed for use in the design or assessment.

2.28 Documentation relating to consultation and special requirements of those consulted shall be included as part of the AIP submission.

Proposals for designs

2.29 In addition to proposals for categories, proposals for designs shall address the following:

1) sustainability;
2) environment (both the natural and built environment) and the requirements of any cultural heritage, environmental management plans and walking, cycling and horse riding assessments;
3) aesthetics;
4) buildability;
5) structure robustness;
6) structure resilience;

7) water management (describe how water will be managed within the design of the structure. This includes internally (transport of water on and through the structure and sealing of elements to prevent water ingress) and externally (global management considering interface with other assets, such as watercourses, drainage, pavement, geotechnical features, etc.);
8) maintenance and operational commitments in terms of whole-life costs in design options and choices of materials;
9) provision of safe access for periodic inspection;
10) avoidance of a 'barrier to trade' and the requirements for using proprietary manufactured structures or products; and,
11) resilience and security.

2.30 Proposals for designs shall include for the likelihood of future heavier loads, all lane running and/or widening and describe how the structure may be upgraded.

2.30.1 In the case of road tunnels, proposals for designs should consider future development above or adjacent to the tunnel.

NOTE *It is not intended that additional provision be included within the design unless agreed with the Overseeing Organisation.*

2.31 For major structures and those sited in environmentally sensitive locations the TAA shall be consulted at an early stage to determine whether submission is required to relevant environmental or architectural bodies or a design panel.

NOTE 1 *Major structures can include tunnel portals, tunnel service buildings and landscaping.*

NOTE 2 *Environmentally sensitive locations can include National Parks, areas of outstanding natural beauty, green-belts and urban areas.*

2.32 Proposals for designs must comply with the relevant environmental and planning legislation during the development of the design.

NOTE *Legislation includes, but is not limited to, environmental assessments, environmental statements and habitat surveys.*

2.33 Affected stakeholders shall be consulted to ascertain environmental requirements during the development of the design and post construction.

NOTE *For example translocation of endangered species, acceptable environmental mitigation and other measures where existing habitats are disrupted.*

2.34 Where proposals are located close to or cross watercourses, the relevant national environmental body shall be consulted.

2.35 Proposals for designs shall state any assumptions that have been made with regard to construction processes or temporary works aspects that are significant factors in the design.

NOTE *For example the design of an integral bridge could assume a phi value or stiffness for abutment backfill.*

2.36 Where construction processes or temporary works during the course of construction have structural implications different from those assumed by the Designer, the TA shall be consulted and agreement obtained before the commencement of construction of that part of the works.

2.37 Proposals by the Designer for an independent checker shall be submitted to the TAA for consideration/agreement.

NOTE *Agreement to checkers for category 3 structures depends on relevant experience and competence.*

Proposals for assessments

2.38 In addition to proposals for designs, proposals for assessments shall describe proposed arrangements for access, traffic management and intrusive investigation where required.

Departures from standards

2.39 All applications for departures shall be subject to the approval procedures of the Overseeing Organisation.

NOTE *Designers or assessors can seek to introduce innovative techniques, research findings or developments in the state of the art and best practice by the adoption of departures.*

2.40 Applications for departures shall include reasons and justification, including benefits and dis-benefits to the Overseeing Organisation.

2.41 Applications for departures shall allow sufficient time for consideration by the Overseeing Organisation prior to inclusion in the AIP or an addendum to the AIP.

NOTE *In some cases the checker's comments on the proposed departure can be required to assist the TAA in the deliberation.*

2.42 Where UK national standards are used, the limitations for the use of departures shall be given in the Overseeing Organisation's requirements.

2.43 Where a structure is in the ownership of the Overseeing Organisation but accommodates other infrastructure that is the responsibility of another party, the party concerned shall be consulted by the Designer or Assessor.

NOTE *Factors that affect the design, construction phasing, and obtaining any required agreements together with timescales need to be taken account of.*

2.43.1 A record of consultation and any agreements in place or to be put in place with the party should be recorded in the AIP.

NOTE *Areas of specific concern can include vehicle restraint systems especially in transition areas, drainage, slopes, maintenance, etc. It is recommended that where possible individual responsibilities are agreed and set out during design and operational phases of the work.*

Submission for AIP

2.44 Submissions for AIP to the TAA shall be in accordance with the Overseeing Organisation's requirements.

NOTE *Generally submissions comprise a completed AIP, a location plan, a general arrangement drawing, relevant parts of the geotechnical investigation report, documents relating to consultation and any other relevant information or reports.*

2.44.1 A single AIP for the whole structure, should be submitted by the Principal Designer.

2.44.2 Where the designs of the superstructure, substructure and/or foundation are carried out by different teams, the designer of the superstructure and/or substructure should give the conditions and loads to be taken into account by the designer of the substructure and/or foundations respectively.

NOTE *The Principal Designer is responsible for ensuring that any separately designed elements are compatible.*

2.44.3 Relevant information and reports submitted to the TAA should be referenced in the AIP and written with regard to a clear proposal or objective.

2.45 Calculations and detailed drawings shall not form part of the submission.

NOTE *Any submitted calculations and detailed drawings will not be reviewed by the TAA.*

2.46 The AIP (or O/AIP) shall be based on the relevant sections of the model AIPs provided in Appendix A, Appendix B or Appendix O.

2.47 The AIP shall record all the agreed criteria on which the design or assessment is to be based.

2.48 Deviations from an agreed AIP to account for subsequent variations during design, assessment or execution shall render the AIP invalid.

2.49 Revisions to the AIP shall be agreed by the TAA.

2.50 Agreement shall be confirmed either in the form of an amended version of the agreed AIP or as a separate addendum to the agreed AIP.

2.51 Revised AIP submissions to the TAA for agreement shall:

1) clearly indicate deletions or additions that have been made to the agreed AIP;
2) take account of any comments or conditions of approval imposed by the TAA on the original submission;
3) be signed by the Designer/Assessor and Checker and forwarded with supporting information to the TAA; and,
4) ensure addenda refers to the original AIP by the date of agreement by the TAA.

NOTE *Retaining the same clause numbering as the original AIP, showing mark-ups, etc. help all reviewers to understand the changes and to minimise duplication of work.*

2.51.1 TA should start at an early stage of development of proposals.

NOTE 1 *This is particularly important for structures where early submission of AIP to the TAA allows timely consideration of other fundamental aspects, such as crossing requirements and carriageway alignment.*

NOTE 2 *The period over which TA extends can vary according to the size and complexity of the structure and number of departures. To avoid any unnecessary delay, AIP can be given in stages in the form of interim AIP as principles are evolved. However, the use of interim AIP does not prejudice the agreement of an AIP for the full structure.*

Technical approval

2.52 Sufficient information shall be provided, by the Designer, to enable the TAA to carry out the following aspects, where applicable:

1) appraise the proposed design or assessment criteria, principles and methods;
2) agree the required working life for the structure and its main components;
3) agree the category of the proposals;
4) ensure consideration has been given to any special studies concerning safety and risk assessment and management that have a bearing on the final design or assessment or the construction process;
5) be satisfied that the following have been considered:
    a) safety;
    b) sustainability;
    c) buildability;
    d) traffic management;
    e) environmental impact;
    f) aesthetics;
    g) structure robustness;
    h) water management;
    i) durability;
    j) maintenance, access and inspection;
    k) upgradeability;
    l) whole life costs;
    m) demolition; and,
    n) compliance with the Overseeing Organisation's requirements;
6) agree the list of documents included in the TAS and departures;
7) appraise the geotechnical conditions and other relevant investigations;

8) appraise the adequacy of existing records and investigation data and the need for further investigations; or studies that have a significant bearing on the preliminary or final design, assessment, execution, operation, maintenance or demolition processes;
9) review the adequacy of consultation with other stakeholders and the incorporation of agreed requirements;
10) agree proposed category 3 Checker based on their relevant experience and competence;
11) resolve any point(s) of difference between the Designer or Assessor and the Checker;
12) confirm agreement of Designer and Checker by signature on AIP; and,
13) for tunnels, confirmation that the tunnel design authority output report has been signed off.

2.53 When satisfied with the proposals, the TAA shall confirm its agreement by signature of the AIP.

2.54 On completion of the detailed design, check or assessment, the TAA shall receive and consider the appropriate certificates for acceptance.

2.55 The agreement of the AIP or acceptance of the certificates by the TAA shall not relieve the Designer, Assessor nor Checker of any of their responsibilities.

NOTE *Responsibilities include the accuracy of information of all information submitted in TA submissions, the validity and arithmetical correctness of the calculations, methods and techniques and their translations into design details and drawings, specification clauses or assessed capacities.*

2.56 The AIP shall be valid for three years after the date of agreement by the TAA.

2.57 Where the construction has not yet commenced within this 3-year period, the AIP shall be re-submitted to the TAA.

2.58 Prior to re-submission of an AIP it shall be reviewed by the Designer.

2.59 Whether any updating or amendment to the design is required shall be determined by the review and the outcome recorded in an amendment or addendum to the AIP.

2.60 The agreement of the TAA to the re-submitted AIP shall be required before the execution can proceed.

2.61 The works examiner shall inform the TAA of any amendments to the design, during execution, which have structural implications.

2.61.1 The proposed works examiner should be notified to the TAA prior to construction (unless already defined in the contract).

2.62 Any amendments which have structural implications shall be included in an addendum to the AIP.

2.63 Certificates shall be revised to take account of the amendments.

2.63.1 Where the proposed erection procedure induces different stresses in the completed structure from those anticipated in the design, any changes to agreed details in the AIPs or certificates should be covered by an AIP addendum and/or additional certificates.

2.64 Any AIP addendum and/or additional certificates shall require acceptance by the TAA before erection commences.

Design and assessment procedure

2.65 The design/assessment shall comply with the AIP.

2.66 The applicability and accuracy of all computer programs used, and the validity of the programs for each application, shall be ensured by the Designer or Assessor.

Checking procedure

2.67 Assessments, designs, drawings, bar bending schedules and other relevant documentation, shall be checked as follows:

1) categories 0 and 1 are checked independently by another engineer who may be from the design/assessment team;
2) category 2 are checked by a check team, which may be from the same organisation but independent of the design/assessment team; and,
3) category 3 are checked by a check team from a separate organisation proposed by the Designer or Assessor and agreed by the TAA.

2.68 The Checker shall carry out the check, with due professional skill and care, in accordance with the agreed AIP.

2.69 The Checker shall carry out a comprehensive examination of all aspects of the design or assessment in accordance with the Overseeing Organisation's requirements.

NOTE *This can include any proposed departures and specification clauses that could affect structural integrity. (e.g. new materials)*

2.70 The check shall include that the calculations are translated accurately into design details and drawings, specification clauses or assessed capacities.

2.71 During the course of the check a report shall be submitted to the Designer or Assessor and TAA for any aspect of the agreed AIP, design or assessment where changes are considered necessary.

2.72 The agreement of the TAA to variations in the AIP shall be confirmed in accordance with clauses 2.47 to 2.51.

2.73 Any disagreement arising between Designer or Assessor and Checker that they cannot resolve shall be notified immediately to the TAA.

2.74 The Checker's analytical models and analytical work shall be independent of that of the Designer or Assessor and carried out without exchange of calculation sheets, or similar analytical work, between the Designer or Assessor and the Checker.

2.74.1 The Designer or Assessor and the Checker may consult with each other during the course of their work to ensure that the results they are obtaining are comparable.

NOTE *The method of analysis employed by the respective teams need not be the same.*

2.75 The Checker shall take responsibility for the applicability and accuracy of all computer programs used in the check and the validity of the programs for each application.

2.75.1 Both activities of design/assessment and check may proceed in parallel.

Certification

2.76 The certificates shall be signed to declare the satisfactory completion of the work involved and that the organisations concerned have exercised due professional skill and care.

NOTE *For some structures the TAA can call a pre-certification meeting with the Designer/Assessor and the Checker, to discuss their findings prior to accepting certificates.*

2.77 Where structures have an assessed capacity of less than current operational needs or there are aspects with the potential to lead to other safety or operational risks in the near future, the Assessor shall notify the TAA and agree any necessary actions before submitting the certificates.

NOTE *In agreement with the TAA this can be included within the assessment report and include recommendations for risk mitigation measures/options with, where possible, timescales.*

2.78 For all proposals, a single organisation shall assume responsibility for the whole of each activity; the design, assessment, check or construction compliance for the entire structure.

NOTE *Clause 2.78 does not preclude the design of elements of the structure being done by others. However, the responsibility for the overall structure remains with the Principal Designer. This ensures that elements are not designed in isolation and the interfaces between any element and the global performance is included in the design. In relation to the detailed design of elements designed by*

others, the Principal Designer could obtain assurance through certification received from another designer, rely on separate certification (accepted by the TAA) or by producing performance requirements where elements are supplied that meet those, (such as identifying loading, dimensional limits, and movement ranges).

2.79 Each certificate shall be endorsed, as required, by the Designer, Assessor, Checker, Contractor's representative and Works Examiner.

2.80 Each certificate shall be submitted where required for acceptance by the TAA.

2.81 Signatories shall be required from the team leader and another from the principal of the organisation concerned.

2.81.1 The team leader may be the Designer, Assessor or Checker.

2.82 All signatories to certificates shall:

1) be authorised to sign on behalf of their organisation;
2) be competent in the field of work undertaken; and,
3) have relevant experience and appropriate engineering qualifications.

2.83 Signatories' qualifications shall be clearly indicated on the certificate along with their name and position in their organisation.

2.84 Signatories for the construction compliance certificate shall comprise a representative of the Contractor and principals of both the Contractor and of the Works Examiner.

2.85 The signatory for the TAA shall be a person delegated to undertake this task on its behalf.

2.86 Where TAA agrees that the design of the superstructure, substructure and/or foundations of highway structures are carried out by different teams, the conditions and loads imposed by the superstructure and/or substructure for the design of the substructure and/or foundation respectively shall be given in the AIP and/or certificate as applicable.

NOTE *Clause 2.86 above does not negate the requirement for a single organisation to take overall responsibility for the design of the entire structure.*

2.87 Where a proprietary structure or product is supplied in accordance with an O/AIP, and the item has been CE marked in accordance with the CPR, the Designer shall confirm to the TAA in a certificate that they have inspected the declared performance under the CE mark and that declared performance of the item meets the requirements of the O/AIP (refer to Appendix P).

2.88 For category 1, 2 and 3 structures the design, assessment and check certificates shall refer to the relevant AIP and any addenda by their respective dates of agreement by the TAA, and any Departures.

2.89 Where additional and substitute specification clauses have been prepared by the Designer, they shall be endorsed by the Checker, if in agreement, and submitted as a Departure from standards for acceptance by the TAA.

NOTE *Many specifications require the designer to prepare a schedules of performance requirements or set out requirements within an appendix. A Departure is not required for these provided these are prepared in compliance with that specification.*

2.89.1 Additional and substitute specification clauses may be submitted either individually or collectively on a specification certificate.

2.90 Where additional and substitute specification clauses can affect structural integrity, for example clauses concerning new materials, they shall be checked in accordance with the AIP.

2.91 For category 0 structures, the design, assessment and check certificates shall refer to the relevant standards and departures and be submitted for acceptance by the TAA, unless otherwise stated in Sections 3 to 6.

2.92 A copy of the general arrangement drawing and any relevant supporting information shall accompany certificates for category 0 structures.

2.92.1 Where several similar category 0 or 1 structures occur in a project, with the agreement of the TAA a single certificate may be used to cover them.

2.93 Construction of the structure shall not proceed until the design or assessment certificates have been formally accepted by the TAA.

2.94 The construction compliance certificate shall be submitted to the TAA for acceptance by the Overseeing Organisation.

2.95 The public shall not be permitted to use a structure or have access to places where their safety would depend on the integrity of that structure until the TAA has accepted the Construction Compliance Certificate.

2.95.1 The TAA may agree an interim certificate to allow highways to be opened while the information for the final certificate is being prepared.

NOTE 1 *Typically as-built drawings, bar bending schedules and material schedules are completed after construction.*

NOTE 2 *The Interim Construction Compliance Certificate can be based on the model in Appendix N, but clearly marked as "Interim" and omitting any reference to "as-constructed drawings and bar bending schedules".*

2.96 Unless otherwise stated in Sections 3 to 6, the construction compliance certificate shall refer to, if available, the relevant AIP, design and check certificates, specification and as-constructed drawings.

2.97 The format of certificates shall be agreed with the Overseeing Organisation.

NOTE 1 *The wording on certificates can vary depending on the Overseeing Organisation's particular requirements/type of contract.*

NOTE 2 *Model certificates are provided in Appendices I to N.*

2.97.1 Where the completed certificate consists of more than one page, each page should be identifiable by the name of the project and by the name and reference number of the structure and the date of preparation.

2.98 The forms of certificate defined in the contract requirements shall be used.

2.99 All certification, after acceptance by the TAA, shall be uploaded onto the Overseeing Organisation's structures management system.

Records

2.100 Relevant data, information and documents, which have an effect on safety, access, structural or traffic management, such as assessed load carrying capacity of structure, shall be recorded as required by the Overseeing Organisation's management system for structures.

2.101 For categories 2 or 3 checks, when Eurocodes are used, the Designer's record for the choices and options adopted shall not be submitted to the TAA.

2.102 For categories 2 or 3 checks, when Eurocodes are used, the Designer record shall be recorded as required in the Overseeing Organisation's management system for structures.

3. Bridges and other highway structures

3.1 This section covers specific TA requirements for bridges and other highway structures and shall be read in conjunction with Sections 1 and 2.

3.2 The TA requirements shall be applied without limitation to:

1) design and execution of new structures;
2) assessment and related construction work, whether refurbishment, maintenance or strengthening, that affects structural integrity;
3) assessment relating to loading beyond that for which a structure has been designed or previously assessed; and,
4) assessment relating to loading for which a structure has been designed or previously assessed but the condition of the critical structural elements has subsequently deteriorated to the extent that a reassessment is required.

3.3 In addition to 1.1, the procedures described in this Section shall be applied to the following highway structures:

1) bridge, buried structure, subway, underpass, culvert and any other structure over the highway or supporting the highway with a clear span or internal diameter greater than 0.9 m;
2) overhead crossing carrying conveyor or utility service;
3) movable inspection access gantry, gantry rail and gantry support system;
4) earth retaining structure where the effective retained height, i.e. the level of fill at the back of the structure above ground level in front of the structure is greater than 1.5 m;
5) reinforced/strengthened soil/fill structure, with hard facings where the effective retained height is greater than 1.5 m;
6) reinforced/strengthened soil/fill which is an integral part of another highway structure;
7) portal and cantilever sign and/or signal gantry;
8) minor structures listed below:
    a) cantilever mast for traffic signal and/or speed camera;
    b) lighting column;
    c) high mast of more than 20 m in height, i.e. the vertical distance from top of post to bottom of flange plate, for lighting;
    d) mast for monitoring equipment. i.e. camera, radio and telecommunication transmission equipment;
    e) catenary lighting support system;
    f) noise barrier;
    g) traffic sign/signal posts of more than 7 m in height, i.e. the vertical distance from top of post to bottom of flange plate or top of foundation, whichever is the lesser;
    h) other 'mast type' structures identified by the TAA as requiring technical approval.
    i) 'fence type' structures, including environmental barriers, visual screens and fencing, identified by the TAA as requiring technical approval
9) proprietary manufactured structure or product;
10) reinforced/strengthened soil/fill structure where hard facings are not provided and the face inclination exceeds 45 degrees, unless agreed with the Overseeing Organisation that structural TA in accordance with this document is not required;
11) fitting of M&E apparatus and fixtures to existing structures, including tunnels, either permanent or temporary;
12) design, selection and installation of cathodic protection systems for reinforced concrete structures; and,
13) safety critical fixings (as defined in CD 372 [Ref 4.N])

Category

3.4 In addition to 2.20 to 2.26, the following criteria shall be considered when determining category.

3.4.1 The TAA may require a higher or lower category where deemed appropriate.

Category 0

3.5 Category 0 structures shall:

1) conform in all aspects of design, assessment and execution to DMRB and MCHW standards;
2) contain no departures; and,
3) be a structure covered by clause 3.6

3.6 Unless otherwise indicated by the TAA the following structures shall be category 0:

1) single-span structures with span of less than 5 m;
2) buried concrete boxes, buried rigid pipes and corrugated steel buried structures of less than 3 m clear span/diameter and having more than 1 m cover;
3) multi-cell buried structures, where the cumulative span is less than 5 m, and having more than 1 m cover;
4) earth retaining structures with an effective retained height of greater than 1.5 m but less than 2.5 m;
5) minor structures listed within clause 3.3 (8) and not situated at a very exposed site as defined in CD 354 [Ref 3.N];
6) high masts 25 m or less in height and not situated at a very exposed site as defined in CD 354 [Ref 3.N].
7) noise barriers less than 7 m high and without overhangs;
8) masonry arches with span of less than 6.5 m (for assessment only); and,
9) portal and cantilever sign and/or signal gantries compliant with a generic AIP.

Category 1

3.7 Category 1 structures shall:

1) conform in all aspects of design, assessment and execution to DMRB and MCHW standards;
2) contain no departures; and,
3) be a structure covered by clause 3.8.

3.8 Unless otherwise indicated by the TAA the following structures shall be category 1:

1) structures with a single simply supported or integral span of 5 m or greater but less than 20 m and having less than 25° skew;
2) buried concrete boxes, buried rigid pipes and corrugated steel buried structures with a clear span/diameter of 8 m or less;
3) earth retaining structures with an effective retained height of 2.5 m or greater but less than 7 m;
4) minor structures outside the limits of those listed within clause 3.3 item (8) or situated at a very exposed site as defined in CD 354 [Ref 3.N];
5) high masts greater than 25 m in height or situated at a very exposed site as defined in CD 354 [Ref 3.N];
6) noise barriers 7 m or more in height or with overhangs; and,
7) portal and cantilever sign and/or signal gantries with a span of less than 20 m.

Category 2

3.9 Structures not included within the parameters of categories 0, 1 or 3 shall be category 2.

Category 3

3.10 Complex structures which require sophisticated analysis or have any one of the following features shall be category 3:

1) high structural redundancy;
2) unconventional, novel or esoteric design aspects;
3) any span exceeding 50 m;
4) skew exceeding 45 degrees;
5) difficult foundation problems;
6) movable bridges;
7) movable inspection access gantries, gantry rail and gantry support systems;
8) bridges with suspension systems;
9) steel orthotropic decks;
10) post-tensioned concrete structures;
11) earth retaining structures with an effective retained height of 14 m or greater;
12) rock anchorages and anchorages forming part of a structure.
13) portal sign and/or signal gantries with a span greater than 50 m;
14) structures with hidden or difficult to inspect critical elements; or,
15) structures with cathodic protection systems installed in accordance with clause 6.5 of CD 370 [Ref 1.N].

Assessment and related construction work

3.11 The assessment of load carrying capacity of existing structures and related construction work, such as demolition, repair, renewal, refurbishment and strengthening work that affects structural integrity, shall be categorised on the same basis that the original structure would have warranted.

3.11.1 The TAA may require a higher or lower category where deemed appropriate.

Technical approval

3.12 Sufficient information to enable the TAA to consider the following aspects, where applicable, shall be provided by the Designer or Assessor in addition to clause 2.52:

1) cross-section and headroom clearances;
2) the loading and design or assessment criteria;
3) any provision to be made additional to items (1) and (2) for abnormally high and/or heavy loads;
4) the structural adequacy at all stages of construction work, such as repairs, strengthening, monitoring, partial renewals or demolitions;;
5) proposals for the independent checking of temporary works; and,
6) that proper consideration has been given to the adoption of proprietary manufactured structures or products with CE markings by the Overseeing Organisation (see Appendix P).

NOTE *The list in clause 3.12 above is not necessarily exhaustive.*

Certification

3.13 For category 0 minor structures as defined in 3.6(5) a certificate in the form given in Appendix J and an EC certificate or declaration of conformity shall be submitted to the TAA for retention.

Documentation

3.14 The AIP for highway structures within the scope of this section shall be based on the relevant model AIP forms given in Appendices A and B.

3.15 TASs shall be prepared in accordance with the notes given in Appendix H.

3.16 Certificates shall be based on the relevant model certificates given in Appendices I, J and N.

NOTE *The form of certificates can vary depending on the Overseeing Organisation's particular requirements.*

4. Temporary works

4.1 This section describes the TA requirements for temporary works including temporary structures and shall be read in conjunction with Sections 1 to 3.

4.2 All temporary works proposals shall be reviewed and allocated into one of the following categories:

1) type N proposals: temporary works having no potential for impact on client or third party assets or on any person other than those under the direct control of the Principal Contractor;
2) type S (structure) proposals: erection proposals or temporary works which require both:
   a) an independent check of the effects of temporary works on permanent works (refer to the AIP for permanent works), and,
   b) where the works would not affect or potentially affect any highway or other way or area used by or accessible to the public; and,
3) type P (public) proposals: erection proposals, temporary works including those over, under, alongside or otherwise affecting or potentially affecting any highway or other way or area used by, or accessible, to the public.

4.3 Where required a summary of the categorised list shall be provided to the TAA.

4.4 The TA requirements shall be applied to type S and type P proposals.

4.4.1 Where necessary and depending on the degree of risk, the TAA may change the proposal from type N to type S or from type S to type P.

4.4.2 Where the temporary works are permanently left in place (e.g. sheet piling), they may be considered instead, if appropriate, in the AIP of the permanent highway structure.

Scope

4.5 In addition to 1.1, the procedures described in this section shall be applied without limitation to the following temporary structures:

1) temporary works and falsework for major and complex structures;
2) proposals where erection procedure, method of construction or the procedure for the demolition or removal of an existing structure is of critical importance;
3) purpose built or prefabricated forms of temporary works that are alongside or temporarily support or span live carriageways or railway lines or other areas with public access, including facilities or construction procedures that maintain the structural integrity or safe operation of an existing structure; and,
4) temporary works details, erection proposals or construction procedures involving work that affects or potentially affects the structural integrity or operating procedures of a structure during its reconstruction, demolition and removal, maintenance, monitoring, alteration or repair.

Category of temporary works

4.6 The category adopted shall reflect the adverse consequences of any potential failure and comply with clauses 2.20 to 2.26.

4.7 For type N proposals, the Contractor's own procedures shall determine the relevant category.

4.8 For type S proposals, the category shall be the same as the category of the permanent structure.

4.9 For type P proposals, the category shall be 2 or 3.

4.9.1 Where agreed with the TAA that the risk is relatively minor and the reasoning is recorded in the AIP (or certificate in the case of category 0), proposals may be lowered to category 1 or 0.

Design criteria relating to permanent works

4.10 Design criteria for temporary works shall include all relevant design data concerning the design and construction of the permanent works.

4.11 The design data shall include, where applicable:

1) protection and/or safe operation of the permanent work or live carriageway during the use of a temporary highway structure; and,
2) temporary conditions of construction of new designs or the alteration of existing structures.

NOTE *Relevant design data can include allowable deflections, settlements, rotations, loading, jacking forces, propping requirements, clearances, impact protection, erection or demolition procedures, traffic control, carriageway possessions, etc.*

Proposals

4.12 The limits of application of a submission and related certification shall be clearly described and, where applicable, related to constraints of staged construction.

4.13 Proposals shall state the criteria that have been adopted to encompass the technical, operational and safety requirements of the authorities consulted.

4.14 Proposals shall demonstrate to the satisfaction of the TAA that safeguards and contingency measures have been introduced and will be maintained throughout the duration of the work.

Type N proposals

4.15 No certification shall be submitted to the Overseeing Organisation.

NOTE *The Contractor is responsible for all aspects of this work.*

Type S proposals

4.16 For type S temporary works proposals the classification shall be agreed with the TAA.

4.17 Check certificate shall be required to confirm checking is carried out.

4.18 Design certificate and AIP of temporary works shall not be required.

NOTE *They are not required as there is no risk to the public and the contractor is responsible for the safety and adequacy of erection or temporary works proposals.*

4.19 Prior to the commencement of the relevant parts of the works, check certificate(s) based on those given in Appendix K related to type S proposals shall be submitted to the TAA.

4.20 The check certificate shall be recorded and kept in the Overseeing Organisation's management system for the permanent structure.

NOTE *The purpose of requiring a certified independent check is to ensure that not only are the erection proposals and/or temporary works details properly prepared but also that an independent engineer examines and certifies for their adequacy.*

Type P proposals

4.21 Unless otherwise stated in 4.24 and 4.25 or agreed with the TAA as category 0, proposals for temporary works shall be described in an AIP in accordance with the requirements and form of submission described in Section 2.

4.22 Unless otherwise stated in 4.24 and 4.25, all design, checking and certification of temporary works for type P proposals shall comply with the TA procedures of Sections 1 and 2.

4.23 The type P certificate shall be accepted by the TAA before consent to proceed with the works can be given.

4.24 Special requirements given in the respective NAAs shall be complied with for third party proposals of temporary works or temporary structures that are not described in Sections 3 to 6.

4.25 Special requirements given in the respective NAAs shall be complied with where the Overseeing Organisation has no specific competence or expertise to enable it to review the safety aspects of the proposal.

Technical approval

4.26 Sufficient information to enable the TAA to consider the following aspects, where applicable and in addition to clause 2.52, shall be provided by the Designer:

1) structural adequacy and stability at all stages;
2) precautions during erection/dismantling operations;
3) protection of the temporary works (including protection against vehicle or other impact);
4) general provisions in terms of permanent works execution;
5) loading and design criteria, including factors of safety where limit states design codes for bridges are not used;
6) effects on any existing structures or earthworks assessed by the permanent works designer during design;
7) working spaces for installation and removal;
8) clearances and access for construction plant and machinery; and,
9) provision for periodic inspection and checking.

NOTE *The list in clause 4.26 above is not necessarily exhaustive.*

Documentation

4.27 The AIP for temporary works within the scope of this Section shall be based on the model forms given in Appendices A or B, as relevant.

4.28 TASs shall be prepared in accordance with the notes given in Appendix H.

4.29 The certificates shall be based on the model certificates given in Appendices K, L and N.

NOTE *The form of certificates can vary depending on the Overseeing Organisation's particular requirements.*

4.30 A certificate of construction compliance shall be provided for temporary bridges and any structures and installations identified by the TAA .

NOTE *Generally a certificate of construction compliance is not required for temporary works.*

Special requirements concerning third party proposals

4.31 For third party proposals of temporary works or temporary structures that are not described in Sections 3 to 6, or where the Overseeing Organisation does not have a specific knowledge or expertise, the OO shall not be able to give an opinion on whether they are safe or not.

4.32 The third party shall have the required experience and competence to carry out the proposed works and be responsible for them.

4.33 The steps set out in clauses 4.34 and 4.35 shall be taken to ensure that the proposal is safe and the works are safely carried out.

4.34 The third party shall seek an agreement for its proposal and draw up a legal agreement with the Overseeing Organisation.

4.35 The legal agreement shall contain, amongst other things, the following:

1) outline procedures in dealing with the proposal which can include:
   a) certification to confirm that the principles of design and/or execution have been appropriately transformed into an appropriate design using due reasonable professional skill and care;

b) required information to be submitted to the Overseeing Organisation. Where appropriate this could be a general arrangement drawing, reason for structure, type of highway, traffic speed, description of structure, span arrangements, headrooms, foundation types, arrangement for inspection and maintenance, highway and other live loadings, ground conditions, risks and hazards, period of service, etc.;

c) seeking and taking into consideration of Overseeing Organisation considered comments on the proposal. If the Overseeing Organisation consider there is any safety issue and that safety issue is not resolved to the satisfaction of the Overseeing Organisation, the works cannot be carried out; and,

d) administrative processes e.g. establish contact points; agree relevant periods of notices; third party to give notifications; Overseeing Organisation to give comments and requirements; Overseeing Organisation to grant agreement; third party to start work; Overseeing Organisation to serve notice to stop work etc;

2) for temporary works or temporary structures, the following are to be considered:

a) the Overseeing Organisation is not required to approve or disapprove the temporary works or temporary structures or any of their isolated aspects;

b) a statement to confirm that the proposal is in compliance with normal industry standards and practices;

c) clearances e.g. headroom;

d) effect of temporary works or temporary structures on roads such as sight line or other highway structures (load on bridges);

e) where appropriate, requirement of geotechnical certification to CD 622 [Ref 10.N];

f) where there is little or no proven track record of the proposal or the proposal is an innovative solution, it is recommended that the proposal first be tried on a test site or a minor road; and,

g) certification to confirm that the proposal has been checked by an appropriately qualified and competent organisation which is independent from the third party. The relevant experience/competence of the Checker is to be agreed with the Overseeing Organisation before employing them;

3) for aspects other than temporary works or temporary structures, the following are to be considered:

a) for road traffic operations and/or management such as signage, parking and access of support vehicles, coning, lighting etc that are described in sections 3 to 6 or where Overseeing Organisation have the necessary expertise, the normal Overseeing Organisation practices required for appropriate Overseeing Organisation technical approval processes or operational requirements are to be applied; and,

b) the relevant parts of the Design Manual for Roads and Bridges are to be applied and Departures sought where appropriate;

4) agreement on an amount of public liability insurance and provision of a copy of the insurance certificate to the Overseeing Organisation;

5) provide confirmation to the Overseeing Organisation that the third party has taken appropriate safety advice identifying what advice has been taken and from whom;

6) agree to making good of any damages due to the work by the third party and obtain a certificate from the Overseeing Organisation area maintaining agent that the condition of the road network is almost the same before and after the work by the third party; and,

7) confirmation that all costs associated with the proposal will be borne by the third party.

5. Road tunnel and service tunnel structures

5.1 Technical approval (TA) requirements in this section shall be followed for the following:

1) road tunnel structures;
2) service tunnels where the internal diameter is greater than 2 m; and,
3) major tunnelling or building operations within the zone of influence of an existing road tunnel.

5.2 This section shall be read in conjunction with Sections 1, 2 and 6, and in the case of cut-and-over construction and for tunnel portals and road decks, the relevant parts of Section 3.

5.3 The requirements of the Tunnel Design and Safety Consultation Group shall be complied with.

5.4 The TA requirements within this document shall not apply to service tunnels where the internal diameter is 2 m or less.

5.5 For service tunnels where the internal diameter is 2 m or less requirements of CD 622 [Ref 10.N] shall apply.

Scope

5.6 In addition to 1.1, the procedures described in this Section shall be applied to:

1) the design and execution of new road tunnels, tunnel services buildings and service tunnels;
2) the assessment of existing tunnels that are subject to the effects of new temporary or permanent construction above or adjacent to the tunnel structure; and,
3) the refurbishment and strengthening of existing road tunnels.

Category

5.7 In addition to clauses 2.20 to 2.26, proposals for the design or assessment of road tunnel structures and service tunnels shall be in category 3.

Technical Approval

5.8 Sufficient information to enable the TAA to consider the following aspects, where applicable and in addition to clause 2.52, shall be provided by the Designer:

1) structure and form:
   a) methods of excavation and construction including proposed ground categorisation for tunnelling;
   b) tunnel profile;
   c) bore spacing;
   d) portal design;
   e) waterproofing;
   f) maintenance access;
   g) ventilation shafts;
   h) proposed tunnel wall finish;
   i) fire resistance;
   j) stability of ground above portals;
   k) primary support design;
   l) groundwater control;
   m) effect on overlying or adjacent structures or tunnels;
   n) secondary lining and cladding;
   o) ground movements;
   p) loading history of the site and effect of proposed new loading sequences;
   q) the adequacy of the assessment of the loading conditions involved;

r) water management; and,
s) safety critical fixings.

2) alignment and clearances:
a) site constraints;
b) highway and tunnel alignment;
c) stopping sight distances;
d) carriageway and verge widths;
e) duct provision for services;
f) horizontal and vertical clearances;
g) effect of super-elevation;
h) space requirements for equipment beyond the traffic space;
i) cross-connections between traffic bores and escape passages;
j) emergency point spacing;
k) tunnel signing;
l) parking for emergency vehicles;
m) area for casualty attendance; and,
n) emergency crossovers and portal space.

3) general:
a) provision made for inspection and maintenance;
b) proposals for the checking of temporary works;
c) the safeguards adopted to ensure that construction effects are kept within tolerable limits;
d) an intervention facility being in place to regulate progress or halt work in the event of unforeseen situations which might adversely affect or compromise the structural integrity or operational regime of the tunnel; and,
e) the arrangements to sustain all necessary liaison between interested stakeholders.

NOTE *This list in clause 5.8 above is not necessarily exhaustive.*

Documentation

5.9 The AIP for road tunnel and service tunnel structures within the scope of this section shall be based on the model AIP form given in Appendix C.

5.10 TASs shall be prepared in accordance with the notes given in Appendix H.

5.11 Certificates shall be based on the relevant model certificates given in Appendices I and N.

NOTE *The form of certificates can vary depending on the Overseeing Organisation's particular requirements.*

6. Mechanical and electrical installations

6.1 This section describes specific TA requirements for mechanical and electrical (M&E) installations in highway structures and shall be read in conjunction with Sections 1, 2 and 3 or 5 as required.

Scope

6.2 In addition to 1.1, the procedures described in this Section shall be applied without limitation to the following:

1) movable bridges and bridge access gantries;
2) road tunnels and tunnel services buildings; and,
3) pumped drainage installations for underpasses.

Category

6.3 In addition to 2.20 and 2.26, proposals for work covered by this section shall be in category 3.

Proposals

6.4 In addition to clauses 2.27 to 2.29, proposals shall:

1) be presented in terms of preliminary and/or final design proposals as required with due consideration to whole life costs;
2) fully describe the provision to be made for component replacement;
3) fully describe the provision for keeping the facility operational in the event of component failure; and,
4) include a draft report on maintenance and operating procedures (safety consultation document) based on the relevant model document in Appendix F and G.

Technical Approval

6.5 Sufficient information to enable the TAA to consider the following aspects, where applicable and in addition to clause 2.52, shall be provided by the Designer:

1) the adequacy of the consultation and proposals forming the basis of the draft operating procedures (safety consultation document);
2) for movable bridges:
   a) the provision of integrated methods of incorporating safety of road users and bridge operatives (e.g. road barriers and traffic lights, linked to the bridge moving mechanism, to safeguard bridge users);
   b) the static and dynamic loading and design criteria under normal and adverse operating conditions including 'locked-in' stresses and over-turning;
   c) that all loads for the M&E design are consistent with those for the design of the bridge structure;
   d) the adequacy of system redundancy to guard against single component failure; and,
   e) the provision for manual operation (e.g. in the event of power failure or equipment failure).

NOTE *This list in clause 6.5 above is not necessarily exhaustive.*

Mechanical and electrical Installation certification

6.6 The design and check certificates shall take account of 2.82 to 2.96 and be carried out in two stages.

6.7 Stage 1 certification shall:

1) confirm that the principles in the AIP are valid and that they have been translated into appropriate levels of equipping, design and specification;

2) confirm that sufficient information has been provided to enable the detailed design of the installation to be developed and completed in accordance with the Overseeing Organisation's requirements; and,
3) require that details of work tests for equipment/systems tested at the manufacturer's work site and commissioning trials have been specified for the purpose of performance verification and formal handover.

6.8 Stage 2 certification shall confirm that the following meet the Overseeing Organisation's requirements:

1) the completed design proposals;
2) the testing of components; and,
3) the commissioning of the complete installation.

6.9 The format and wording of stage 1 and stage 2 certificates shall be agreed with the TAA.

6.10 A copy of the relevant safety consultation document with original signatures shall accompany the design and check certificates.

Documentation

6.11 The AIPs for highway structures within the scope of this section shall be based on Appendices D and E.

6.12 The relevant safety consultation documents that shall be used are given in Appendices F and G.

6.13 TASs shall be prepared in accordance with the notes given in Appendix H.

6.14 The certificates shall be based on the relevant model certificates provided in Appendices I and N.

NOTE *The form of certificates can vary depending on the Overseeing Organisation's particular requirements.*

7. Normative references

The following documents, in whole or in part, are normative references for this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

Ref 1.N	Highways England. CD 370, 'Cathodic protection for use in reinforced concrete structures.'
Ref 2.N	305/2011/EU, 'Construction Products Regulation'
Ref 3.N	Highways England. CD 354, 'Design of minor structures'
Ref 4.N	Highways England. CD 372, 'Design of post-installed anchors and reinforcing bar connections in concrete'
Ref 5.N	Highways England. GD 304, 'Designing health and safety into maintenance'
Ref 6.N	BSI. BS EN 1991-2, 'Eurocode 1. Actions on structures. Traffic loads on bridges'
Ref 7.N	BSI. BS EN 1990, 'Eurocode: Basis of structural design'
Ref 8.N	Highways England. GG 103, 'Introduction and general requirements for sustainable development and design'
Ref 9.N	Highways England. GG 101, 'Introduction to the Design Manual for Roads and Bridges'
Ref 10.N	Highways England. CD 622, 'Managing geotechnical risk'

8. Informative references

The following documents are informative references for this document and provide supporting information.

Ref 1.I	Highways England. CD 352, 'Design of road tunnels'
Ref 2.I	HMSO. Merrison Report, 'Inquiry into the Basis of Design and Method of Erection of Steel Box Girder Bridges'
Ref 3.I	Highways England. Standards for Highways (website), 'www.standardsforhighways.co.uk'