Design Manual for Roads and Bridges

Sustainability & Environment
Design

LD 119
Roadside environmental mitigation and enhancement

(formerly LA 119 which superseded HA 65/94, HA 66/95)

Revision 0

Summary
This document sets out the requirements for the design of roadside environmental mitigation and enhancement on highway projects.

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

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Release notes

Version	Date	Details of amendments
0	Mar 2020	LD 119 replaces LA 119 which superseded HA 65/94 and HA 66/95. This full document has been re-written to make it compliant with the new Highways England drafting rules. LD 119 was originally published as LA 119 in October 2019 and is now republished as LD 119 as the requirements are design requirements (D) and it was incorrectly coded as appraisal requirements before this time (A).

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Foreword

Publishing information

This document is published by Highways England.

This document supersedes the following documents, which are withdrawn:

1) HA 65/94 Design for Environmental Barriers; and
2) HA 66/95 Environmental Barriers: Technical Requirements.

This document also supersedes the following clauses of MCHW Series NG2500 [Ref 1.I], which are withdrawn:

1) NG2504.3;
2) NG2504.14;
3) NG2504.15;
4) NG2504.16;
5) NG2504.17;
6) NG2504.18.

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.

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Introduction

Background

This document includes design advice for roadside environmental mitigation and enhancement.

The need for environmental mitigation and enhancement measures are identified and reported as part of the environmental assessment process.

Assumptions made in the preparation of this document

The assumptions made in GG 101 [Ref 5.N] apply to this document.

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Abbreviations and symbols

Abbreviations

Abbreviation	Definition
HCD	Highway construction details

Symbols

Symbol	Definition
dB	Decibel
dB(A)	A-weighted decibel

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Terms and definitions

Terms

Term	Definition
Absorptive noise barrier	A noise barrier that has an absorptive lining.
A-weighting	In addition to its non-linear amplitude response, the human ear has a non-linear frequency response; it is less sensitive at low and high frequencies and most sensitive in the mid range frequencies. NOTE 1: The A-weighting is applied to measured sound pressure levels so that these levels correspond more closely to the subjective response. NOTE 2: A-weighted noise levels are often expressed in dB(A).
Decibel	The unit of measurement used for sound pressure levels and noise levels quoted in decibels (dB). NOTE 1: The decibel scale is logarithmic rather than linear; the threshold of hearing is zero decibels while, at the other extreme, the threshold of pain is about 130 decibels. NOTE 2: These limits are seldom experienced and typical levels lie within the range of 30 dB(A) (a quiet night time level in a bedroom) to 90 dB(A) (at the kerbside of a busy road).
Earth bund	A bund constructed to provide noise or landscape mitigation.
Environmental assessment	A process by which information about environmental effects is collected, assessed and used to inform decision-making. NOTE: This includes Environmental Impact Assessment and non-statutory environmental assessment.
Insertion loss	A measure of the effectiveness of noise control devices such as silencers and enclosures. NOTE: The insertion loss of a device is the difference, in dB, between the noise level with and without the device present.
Noise barrier	Fence placed between a road and a noise sensitive receptor to reduce noise levels. Includes all elements of the fence (posts and fixings, as well as panels).
Parallel barrier	A noise barrier where there are existing or proposed barriers on the opposite side of the road.
Reflective noise barrier	A noise barrier that reflects noise.
Roadside environmental mitigation	Measure installed on the land between a highway and the boundary of land owned by the Overseeing Organisation to mitigate environmental effects of the highway.
Single barrier	A noise barrier where there are no existing or proposed barriers on the opposite side of the road.

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1. Scope

Aspects covered

1.1 This document shall be used to specify roadside environmental mitigation and enhancement measures, which are measures installed between the nearside carriageway edge and the boundary of land controlled, or planned to be controlled, by the Overseeing Organisation to reduce the impact of the highway on the surrounding environment in terms of:

1) noise;
2) landscape and,
3) visual impact.

1.1.1 Roadside environmental mitigation or enhancement measures may include:

1) earth bunds constructed to mitigate noise, landscape impact and visual impact;
2) visual screens; and/or
3) noise barriers.

NOTE *Roadside environmental mitigation and enhancement measures are normally specified in environmental assessment reports produced as part of the requirements of LA 104 [Ref 2.N].*

Implementation

1.2 This document shall be implemented forthwith on all projects which require roadside environmental mitigation or enhancement on the Overseeing Organisations' motorway and all-purpose trunk roads according to the implementation requirements of GG 101 [Ref 5.N].

Use of GG 101

1.3 The requirements contained in GG 101 [Ref 5.N] shall be followed in respect of activities covered by this document.

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2. Principles and purpose

2.1 Roadside environmental mitigation and enhancement shall be designed to meet the general "principles of good road design" in accordance with GG 103 [Ref 4.N].

2.1.1 The design of roadside environmental mitigation and enhancement should be coordinated with other elements within the highway corridor and be appropriate to the scale and character of the local context.

NOTE *Aesthetic design is not limited to higher profile structures that stand out as a result of their scale or location, but also include features that are regarded as commonplace, widespread and therefore highly visible elements within the highway corridor.*

2.2 Requirements for access determined through risk assessments undertaken in accordance with LA 113 [Ref 9.N] shall be incorporated into the design of roadside environmental mitigation and enhancement.

2.3 Roadside environmental mitigation and enhancement shall be designed to be as unobtrusive in the landscape or townscape as possible or provide visual interest where integration is not feasible.

NOTE 1 *The design process for roadside environmental mitigation and enhancement includes an evaluation of the landscape or townscape context.*

NOTE 2 *The design of roadside environmental mitigation and enhancement can vary considerably in response to individual urban, semi-urban or rural contexts.*

NOTE 3 *Materials and forms appropriate to the landscape or townscape context and the application of architectural principles to the design of roadside environmental mitigation and enhancement can reduce visual impact or provide visual interest.*

2.4 Approval of structures used for roadside environmental mitigation and enhancement shall be obtained following the procedures in CG 300 [Ref 12.N].

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3. Earth bund design

Location

3.1 The locations, heights and lengths of earth bunds required for environmental mitigation shall be determined from environmental statements or environmental assessment reports.

NOTE *Earth bunds can be identified as requirements for mitigation within:*

1) landscape and visual impact chapters; and/or

2) noise chapters.

Structural engineering design

3.2 Earth bunds shall be designed in accordance with BS EN 1997-1 2004 [Ref 3.N].

3.3 The geotechnical risks associated with earth bunds shall be managed in accordance with CD 622 [Ref 7.N].

Appearance

3.4 Earth bunds shall be designed to meet the principles specified in LD 117 [Ref 6.N].

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4. Visual screen design

Location

4.1 The locations, heights and lengths of visual screens required for environmental mitigation or enhancement shall be determined from environmental statements or environmental assessment reports.

NOTE *Visual screens will normally be specified as requirements for mitigation within landscape and visual impact chapters. The chapters can also include specifications for the type of screen (fence or planting).*

4.1.1 Visual screens may be constructed using:

1) barriers or walls;
2) planting
3) false cuttings or earth bunds

4.2 False cuttings or earth bunds intended for use as visual screens shall be designed in accordance with Section 3 of this document.

4.3 Visual screens shall be designed to meet the principles specified in LD 117 [Ref 6.N].

Structural engineering specification

4.4 Where visual screens comprise fencing, they shall be designed in accordance with the relevant part of BS 1722 [Ref 1.N] and the MCHW HCD Drawings [Ref 8.N].

NOTE *BS 1722-5 Table 1 (BS 1722 [Ref 1.N]) recommends post sizes and spacing, but these are not suitable for all locations.*

4.5 Fencing shall be designed for location specific characteristics.

4.5.1 Location specific characteristics that may influence the proposed structural design include:

1) wind loading;
2) ground condition.

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5. Noise barrier design

Location

5.1 The locations, heights and lengths of noise barriers shall be determined using information from environmental statements or environmental assessment reports.

5.1.1 Alternative locations, heights and lengths of noise barrier, or an alternative noise mitigation or enhancement measures, may be used where it is possible to achieve the same or better noise reduction than a barrier determined using information from environmental statements or environmental assessment reports.

NOTE *Noise barriers will normally be identified as requirements for mitigation within noise chapters.*

5.2 Earth bunds intended for use as noise barriers shall be designed in accordance with Section 3 of this document.

Noise barrier specification

5.3 The required sound insulation category specified by BS EN 1793-2 [Ref 11.N] shall be determined by the addition of 15 dB(A) to the maximum insertion loss specified for the barrier in the environmental statement or environmental assessment report.

NOTE *For example, if the insertion loss for a barrier was determined as 3 dB(A), the required sound insulation is to be 18 dB(A), requiring a class B2 barrier.*

5.4 Where the environmental statement or environmental assessment report states that an absorptive barrier is required, the sound absorption shall be determined by BS EN 1793-1 [Ref 10.N], and:

1) where the barrier is determined as a single barrier, a minimum performance of class A1; or,
2) where the barrier is determined as a parallel barrier, a minimum performance of class A3.

5.5 Discretionary or ancillary (site-specific) characteristics that can affect the design or choice of product shall be identified.

5.5.1 Discretionary or ancillary (site-specific) characteristics that can affect the design or choice of product may include:

1) brush fire, shatter (wilful damage) properties, light reflectivity;
2) climatic conditions in the proposed location, including wind, flooding and snow;
3) aesthetics and sustainability with reference to GG 103 [Ref 4.N].

5.6 A generic product shall be selected to be used as the basis for design assumptions.

5.7 The generic product shall:

1) have an acoustic durability of a maximum of 0.25 dB loss per year;
2) have a non-acoustic durability of at least 20 years;
3) meet the requirements in this section for earth bunds used as noise barriers, specifying the sound insulation category, and sound absorption for required absorptive barriers.

5.8 The characteristics of the generic product shall be used to derive self weight.

5.9 The self weight shall be used to calculate the following loading on the acoustic elements:

1) vertical loading;
2) normal (90^{o}) wind and static loading;
3) where snow blowers are used in the barrier location, normal (90^{o}) loading from snow clearance.

5.10 The self weight shall be used to calculate the following loading on the structural elements and foundations:

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1) vertical loading;
2) normal (90^{o}) wind, static and self weight loading;
3) where snow blowers are used in the barrier location, maximum bending from snow clearance.

NOTE *Noise barrier characteristics can be found in Appendix A.*

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6. 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	BSI. BS 1722, 'BS1722: Fences'
Ref 2.N	Highways England. LA 104, 'Environmental assessment and monitoring'
Ref 3.N	BSI. BS EN 1997-1, 'Eurocode 7: Geotechnical design - Part 1: General rules' , 2004
Ref 4.N	Highways England. GG 103, 'Introduction and general requirements for sustainable development and design'
Ref 5.N	Highways England. GG 101, 'Introduction to the Design Manual for Roads and Bridges'
Ref 6.N	Highways England. LD 117, 'Landscape design'
Ref 7.N	Highways England. CD 622, 'Managing geotechnical risk'
Ref 8.N	Highways England. MCHW HCD Drawings, 'Manual of Contract Documents for Highway Works Volume 3: Highway Construction Details'
Ref 9.N	Highways England. LA 113, 'Road drainage and the water environment'
Ref 10.N	BS EN. BS EN 1793-1, 'Road traffic noise reducing devices - Test method for determining the acoustic performance. Part 1. Intrinsic characteristics of sound absorption'
Ref 11.N	BS EN. BS EN 1793-2, 'Road traffic noise reducing devices - Test method for determining the acoustic performance. Part 2. Intrinsic characteristics of airborne sound insulation'
Ref 12.N	Highways England. CG 300, 'Technical approval of highway structures'

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7. Informative references

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

Ref 1.I	MCHW Series NG2500, 'Manual of Contract Documents for Highway Works. Volume 2 - Notes for Guidance on the Specification for Highway Works. Series 2500 Special Structures'

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Appendix A. Noise barrier characteristics

Table A.1 Noise barrier characteristics

Essential characteristics clauses	Design requirement
Sound absorption	A1 or A3 minimum
Airborne sound insulation	Insertion loss +15dB minimum
Acoustic element Resistance to load: Self weight	Designer selects a "generic" product Theoretical self-weight wet, semi wet, dry
Acoustic element Resistance to load: Maximum vertical load	Designer calculation
Acoustic element Resistance to load: Maximum normal (90º) load	Designer calculation
Structural element Resistance to load: Maximum normal (90º) load	Designer calculation
Structural element Resistance to load: Maximum bending moment	Designer calculation- snow clearance, site specific
Acoustic element Resistance to load: Maximum normal load	Designer calculation- snow clearance, site specific
Resistance to brush fire	Designer discretion- site specific
Shatter properties	Designer discretion- site specific
Light reflectivity	Designer discretion- site specific
Release of dangerous substances	Not defined
Acoustic durability	0.25 dB/year maximum loss
Non-acoustic durability	20 Years minimum

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