



Pavement
Design

CD 236

Surface course materials for construction

(formerly HD 36/06, IAN 156/16)

Revision 3

Summary

This document provides requirements for pavement surfacing for both flexible and rigid pavements.

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.

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Release notes

Version	Date	Details of amendments
3	Apr 2019	CD 236 replaces HD 36/06 and IAN 156/16. The full document has been re-written to make it compliant with the new Highways England drafting rules. It includes a limited number of technical modifications related to the selection of the polished stone value of the aggregates. Revision 3 includes an update of the Scotland National Application Annex.

Foreword

Publishing information

This document is published by Highways England.

This document supersedes HD 36/06 and IAN 156/16 which are withdrawn.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.

WITHDRAWN

Introduction

Background

The appropriate choice of surface course material plays a key role in providing roads that are safe, meet the needs of the user and offer good value for money. Permitted surface course materials and guidance on their selection are presented in this document.

In dry conditions all clean, surfaced roads have a high skidding resistance. However in wet conditions the skidding resistance is reduced. Using aggregates with an appropriate resistance to polishing for a particular site and traffic loading should result in a surfacing giving wet skidding resistance above the appropriate Investigatory Level (IL) assigned in accordance with HD 28 [Ref 2.N].

Assumptions made in the preparation of the document

The assumptions made in GG 101 [Ref 1.N] apply to this document.

Abbreviations

Abbreviations

Abbreviation	Definition
AADF	Average annual daily flow (1-direction)
AAV	Aggregate abrasion value
BOS	Basic oxygen slag
CAUTS	Cold applied ultra-thin surfacing
CSC	Characteristic skid coefficient
EAC	Exposed aggregate concrete
HFS	High friction surfacing
HRA	Hot rolled asphalt
IL	Investigatory Level
MCHW	Manual of Contract Documents for Highway Works
NAA	National Application Annex
PSV	Polished stone value
TSCS	Thin surface course system

Terms and definitions

Terms

Term	Definition
Departure	Variation or waiving of a requirement carried out in accordance with the Overseeing Organisation's procedures.
High friction surfacing	Specialised high friction surfacing conforming to clause 924 of the Specification for Highway Works (MCHW1) [Ref 3.N].
Thin surface course systems	Thin surface course systems conforming to clause 942 of the Specification for Highway Works (MCHW1) [Ref 3.N].

1. Scope

Aspects covered

- 1.1 This document shall be applied to surface course materials for new and maintenance construction on both flexible and rigid pavements.
- NOTE 1 This document gives requirements for aggregates in surface course materials, which aim to ensure that appropriate skidding resistance is provided on roads.*
- NOTE 2 Additional requirements for aggregates used in pavement construction can be found in the Specification (MCHW1) Series 700, 900 and 1000, [Ref 3.N] together with the Notes for Guidance MCHW Volume 2 [Ref 6.I].*
- NOTE 3 Detailed information on bituminous material types and surfacing processes can be found in HD 37 [Ref 1.I].*
- NOTE 4 Detailed information on concrete surfacing and materials can be found in HD 38 [Ref 3.I].*
- NOTE 5 Detailed information on maintenance of concrete roads can be found in HD 32 [Ref 5.I].*
- NOTE 6 This document does not cover the requirements for footways and cycle paths, which can be found in HD 39 [Ref 4.I].*
- 1.2 This document shall be read in conjunction with 'Skidding resistance' HD 28 [Ref 2.N].

Implementation

- 1.3 This document shall be implemented forthwith on all schemes involving design of road pavement surface on the Overseeing Organisations' motorway and all-purpose trunk roads according to the implementation requirements of GG 101 [Ref 1.N].

Use of GG 101

- 1.4 The requirements contained in GG 101 [Ref 1.N] shall be followed in respect of activities covered by this document.

2. Surface course material options

- 2.1 The specific requirements for surface course material options of the Overseeing Organisation shall apply as provided in the National Application Annexes.

NOT FOR CONSTRUCTION

3. Aggregate selection

Polished stone value (PSV) and aggregate abrasion value (AAV)

- 3.1 Coarse aggregates or chippings shall undergo polished stone value (PSV) testing in accordance with BS EN 1097-8 [Ref 4.N] to determine the resistance to polishing under the action of traffic.
- 3.2 The appropriate PSV for the coarse aggregate shall be selected from Table 3.2a or Table 3.2b based on the relevant site categories and traffic levels.

Table 3.2a : PSV for chippings or coarse aggregate in surfacings (excluding thin surface course systems complying with clause 942 of the Specification (MCHW1)

Site category	Site description	IL	PSV required for given IL, traffic level and type of site									
			Traffic (cv/lane/day) at design life									
			0-250	251-500	501-750	751-1000	1001-2000	2001-3000	3001-4000	4001-5000	5001-6000	Over 6000
A	Motorway	0.3	50	50	50	50	50	55	55	60	65	65
		0.35	50	50	50	50	50	60	60	60	65	65
B	Non-event carriageway with one-way traffic	0.3	50	50	50	50	50	55	55	60	65	65
		0.35	50	50	50	50	50	60	60	60	65	65
		0.4	50	50	50	55	60	65	65	65	65	68+
C	Non-event carriageway with two-way traffic	0.35	50	50	50	55	55	60	60	65	65	65
		0.4	55	60	60	65	65	68+	68+	68+	68+	68+
		0.45	60	60	65	65	68+	68+	68+	68+	68+	68+
Q	Approaches to and across minor and major junctions, approaches to roundabouts and traffic signals	0.45	60	65	65	68+	68+	68+	68+	68+	68+	HFS
		0.5	65	65	65	68+	68+	68+	HFS	HFS	HFS	HFS
		0.55	68+	68+	HFS	HFS	HFS	HFS	HFS	HFS	HFS	HFS
K	Approaches to pedestrian crossings and other high-risk situations	0.5	65	65	65	68+	68+	68+	HFS	HFS	HFS	HFS
		0.55	68+	68+	HFS	HFS	HFS	HFS	HFS	HFS	HFS	HFS
R	Roundabout	0.45	50	55	60	60	65	65	68+	68+	68+	68+
		0.5	68+	68+	68+	68+	68+	68+	68+	68+	68+	68+
G1	Gradient 5-10% longer than 50m	0.45	55	60	60	65	65	68+	68+	68+	68+	68+
		0.5	60	68+	68+	HFS	HFS	HFS	HFS	HFS	HFS	HFS
G2	Gradient >10% longer than 50m	0.45	55	60	60	65	65	68+	68+	68+	68+	68+
		0.5	60	68+	68+	HFS	HFS	HFS	HFS	HFS	HFS	HFS
		0.55	68+	HFS	HFS	HFS	HFS	HFS	HFS	HFS	HFS	HFS
S1	Bends radius <500m - carriageway with one-way traffic	0.45	50	55	60	60	65	65	68+	68+	HFS	HFS
		0.5	68+	68+	68+	HFS	HFS	HFS	HFS	HFS	HFS	HFS
S2	Bend radius <500m - carriageway with two-way traffic	0.45	50	55	60	60	65	65	68+	68+	HFS	HFS
		0.5	68+	68+	68+	HFS	HFS	HFS	HFS	HFS	HFS	HFS
		0.55	HFS	HFS	HFS	HFS	HFS	HFS	HFS	HFS	HFS	HFS

Table 3.2b : PSV for coarse aggregate in thin surface course systems complying with clause 942 of the Specification (MCHW1)

Site category	Site description	IL	Minimum PSV required for given IL, traffic level and type of site									
			Traffic (cv/lane/day) at design life									
			0-250	250-500	501-750	751-1000	1001-2000	2001-3000	3001-4000	4001-5000	5001-6000	Over 6000
A	Motorway	0.3	50	50	50	50	50	50	50	53	63	63
		0.35	50	50	50	50	50	53	53	53	63	63
B	Non-event carriageway with one-way traffic	0.3	50	50	50	50	50	50	50	53	63	63
		0.35	50	50	50	50	50	53	53	53	63	63
		0.4	50	50	50	50	53	58	58	58	63	68+
C	Non-event carriageway with two-way traffic	0.35	50	50	50	50	50	53	53	58	63	63
		0.4	50	53	53	58	58	63	63	63	68+	68+
		0.45	53	53	58	58	63	63	63	63	68+	68+
Q	Approaches to and across minor and major junctions, approaches to roundabouts and traffic signals	0.45	60	65	65	68+	68+	68+	68+	68+	68+	HFS
		0.5	65	65	65	68+	68+	68+	HFS	HFS	HFS	HFS
		0.55	68+	68+	HFS	HFS	HFS	HFS	HFS	HFS	HFS	HFS
K	Approaches to pedestrian crossings and other high risk situations	0.5	65	65	65	68+	68+	68+	HFS	HFS	HFS	HFS
		0.55	68+	68+	HFS	HFS	HFS	HFS	HFS	HFS	HFS	HFS
R	Roundabout	0.45	50	55	60	60	65	65	68+	68+	68+	68+
		0.5	68+	68+	68+	68+	68+	68+	68+	68+	68+	68+
G1	Gradient 5-10% longer than 50m	0.45	55	60	60	65	65	68+	68+	68+	68+	68+
		0.5	60	68+	68+	HFS	HFS	HFS	HFS	HFS	HFS	HFS
G2	Gradient >10% longer than 50m	0.45	55	60	60	65	65	68+	68+	68+	68+	68+
		0.5	60	68+	68+	HFS	HFS	HFS	HFS	HFS	HFS	HFS
		0.55	68+	HFS	HFS	HFS	HFS	HFS	HFS	HFS	HFS	HFS
S1	Bend radius <500m - carriageway with one-way traffic	0.45	50	55	60	60	65	65	68+	68+	HFS	HFS
		0.5	68+	68+	68+	HFS	HFS	HFS	HFS	HFS	HFS	HFS
S2	Bend radius <500m - carriageway with two-way traffic	0.45	50	55	60	60	65	65	68+	68+	HFS	HFS
		0.5	68+	68+	68+	HFS	HFS	HFS	HFS	HFS	HFS	HFS
		0.55	HFS	HFS	HFS	HFS	HFS	HFS	HFS	HFS	HFS	HFS

NOTE Table 3.2a applies to all types of surface course materials with the exception of clause 942 thin surface course systems (TSCS), for which Table 3.2b is applicable.

3.3 The Aggregate Abrasion Value (AAV) of the coarse aggregate or chippings shall be determined in accordance with Annex A BS EN 1097-8 [Ref 4.N] to determine the durability or resistance of the aggregate to abrasion under the action of traffic.

3.4 The appropriate AAV for the coarse aggregate shall be selected from Table 3.4, based on the relevant site categories and traffic levels.

Table 3.4 Maximum AAV of chippings, or coarse aggregates in unchipped surfaces, for new surface courses

Traffic (cv/lane/day) at design life	<250	251 - 1000	1001 - 1750	1751 - 2500	2501 - 3250	>3250
Max AAV for chippings for hot rolled asphalt, surface dressing and for aggregate in slurry and microsurfacing systems	14	12	12	10	10	10
Max AAV for aggregate in thin surface course systems, CAUTS, exposed aggregate concrete surfacing and asphalt concrete surface course	16	16	14	14	12	12
Note: The maximum AAV requirement for porous asphalt is specified in clause 938 of the Specification (MCHW 1 [Ref 3.N]).						

3.5 Limestone aggregates shall not be used as the coarse aggregate or chippings in surface courses.

3.6 The appropriate PSVs and AAVs shall be inserted in Appendix 7/1 of the Specification (MCHW1 [Ref 3.N]).

3.7 For new roads the justification for selecting PSV from unemboldened rows of Table 3.2a or Table 3.2b shall be recorded.

NOTE The bold numeral rows in Table 3.2a or Table 3.2b indicate the levels of PSV appropriate to the lowest CSC dark shaded cell in Table 4.1 (Site categories and investigatory levels) of HD 28 [Ref 2.N].

3.8 Where '68+' material is listed in Table 3.2a or Table 3.2b, none of the three most recent results from consecutive PSV tests relating to the aggregate to be supplied shall fall below 68.

3.9 Basic Oxygen Steel (BOS) slag complying with the chemical composition in Table 3.9 shall be classified as equivalent to PSV₆₀ aggregate up to and including 4,000 cv/lane/day traffic at design life in site categories A, B and C when used in a TCSC complying with clause 942 of the Specification (MCHW 1 [Ref 3.N]).

Table 3.9 : Permitted chemical composition for Basic Oxygen Slag (BOS)

Chemical	Percentage by mass (%)
Fe ₂ O ₃	20 - 30
CaO	40 - 50
SiO ₂	10 - 15
MgO	4 - 10

Lower polished stone value (PSV)

3.10 Where an aggregate with a lower PSV than indicated in Table 3.2a or Table 3.2b is proposed, departure approval shall be sought from the Overseeing Organisation.

3.11 As part of the justification for departure, it shall be demonstrated that the aggregate with a lower PSV than indicated in Table 3.2a or Table 3.2b proposed has achieved the required life, skid resistance and skidding accident rate on a road of similar geometry, traffic volume and meteorological conditions.

Site category and investigatory level

- 3.12 The site category and investigatory level to be used in Table 3.2a or Table 3.2b shall be those which have been allocated to the specific site on which the material is to be laid.
- 3.13 Site category and investigatory level shall be determined by following the procedures in HD 28 [Ref 2.N].

Traffic flow

- 3.14 The traffic flow used to determine the appropriate PSV and AAV for a particular surfacing shall be the design traffic as commercial vehicles per lane per day (cv/lane/day) based on the Average Annual Daily Flow (AADF) predicted to be using the lane at the end of the anticipated life of the surfacing.
- 3.14.1 Estimates of traffic growth rates and life of the surfacing may be based on local experience.

NOTE Information on traffic flow can be found in HD 24 [Ref 7.I].

- 3.15 For maintenance schemes where classified traffic counts are not generally available and automatic counters are used for vehicle counts, the number of commercial vehicles per lane shall be regarded as equivalent to the number of vehicles >6.6m in length.
- 3.16 For new construction and complete carriageway re-surfacing, the level of PSV chosen shall reflect the design traffic flows for each individual lane.
- 3.17 Where a single lane is being resurfaced for maintenance purposes the appropriate PSV and AAV shall be used for that lane.

NOTE The PSVs and AAVs chosen need not match the values of existing adjacent surfacing.

- 3.18 For lanes with a design traffic of zero commercial vehicles the minimum PSV for surface coarse aggregates shall be 50.
- 3.19 Where the traffic flow on motorways within site category A exceeds 6,000 commercial vehicles per day, the specified PSV for surface coarse aggregates shall not exceed those specified in Table 3.2a or Table 3.2b.

Gyratory junctions

- 3.20 A maximum nominal aggregate size of 10mm shall be used in a thin surface course system on the circulatory part of a roundabout or other gyratory junction or other highly stressed sites.

High friction surfacing (HFS)

- 3.21 High friction surfacing (HFS) shall not be used on the circulatory parts of roundabouts, even if traffic signal controlled.
- 3.22 HFS shall not be used solely because a coloured road surface is required.

NOTE Further advice on the use of coloured pavement surfaces can be found in TA 81 [Ref 2.I].

4. 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. GG 101, 'Introduction to the Design Manual for Roads and Bridges'
Ref 2.N	Highways England. HD 28, 'Skidding Resistance'
Ref 3.N	Highways England. 'Specification for Highway Works (MCHW1) Series 700, 900, 1000'
Ref 4.N	BSI. BS EN 1097-8, 'Tests for mechanical and physical properties of aggregates. Part 8: Determination of the Polished Stone Value (PSV)'

5. Informative References

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

Ref 1.I	Highways England. HD 37, 'Bituminous Surfacing Materials and Techniques [Incorporating Amendment No.1 dated May 1999]'
Ref 2.I	Highways England. TA 81, 'Coloured Surfacing in Road Layout (Excluding Traffic Calming)'
Ref 3.I	Highways England. HD 38, 'Concrete Surfacing and Materials'
Ref 4.I	Highways England. HD 39, 'Footway and Cycleway Design '
Ref 5.I	Highways England. HD 32, 'Maintenance of concrete roads'
Ref 6.I	Highways England. MCHW Volume 2, 'Notes for Guidance on the Specification for Highway Works'
Ref 7.I	Highways England. HD 24, 'Traffic Assessment'

Notification

This document was notified in draft to the European Commission in accordance with Technical Standards and Regulations Directive 2015/1535/EU.

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Pavement
Design

CD 236

England National Application Annex to CD 236 Surface course materials for construction

(formerly HD 36/06)

Revision 3

Summary

This National Application Annex gives the Highways England specific requirements on pavement surfacing for both flexible and rigid pavements.

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
3	Apr 2019	Highways England National Application Annex to CD 236. This document contains Highways England requirements and advice for section 2 of CD 236 related to pavement surfacing for both flexible and rigid pavements. Revision 3 was no change and was issued alongside revision 3 of the core requirements document.

Foreword

Publishing information

This document is published by Highways England.

This document is a National Application Annex to CD 236 [Ref 4.N].

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.

WITHDRAWN

Introduction

Background

This National Application Annex gives the Highways England-specific requirements related to pavement surfacing for both flexible and rigid pavements.

Assumptions made in the preparation of the document

The assumptions made in GG 101 [Ref 2.N] apply to this document.

WITHDRAWN

Abbreviations

Abbreviations

Abbreviation	Definition
CAUTS	Cold applied ultra-thin surfacings
EAC	Exposed aggregate concrete
HRA	Hot rolled asphalt
MCHW	Manual for Contract Documents for Highways Works
TSCS	Thin surface course systems

Terms and definitions

Terms

Term	Definition
Departure	Variation or waiving of a requirement carried out in accordance with the Overseeing Organisation's procedures.

WITHDRAWN

E/1. Surface course material options (CD 236, 2.1)

Choice of surfacing

E/1.1 Surface course materials shall be selected from the permitted options provided in Table E/1.1 from MCHW1 [Ref 3.N].

Table E/1.1 Permitted pavement surface course materials for new and maintenance construction

	Use without departure	Departure required
New Construction	MCHW1 Clause 924 High Friction Surfacing MCHW1 Clause 942 Thin Surface Course System MCHW1 Clause 943 Hot Rolled Asphalt MCHW1 Clause 1026 Performance Concrete Surface (see Note 2)	MCHW1 Clause 1044 Exposed Aggregate Concrete (see Note 2) MCHW1 Clause 938 Porous Asphalt
Maintenance	MCHW1 Clause 923 Cold Applied Ultra-Thin Surfacing MCHW1 Clause 924 High Friction Surfacing MCHW1 Clause 942 Thin Surface Course System MCHW1 Clause 943 Hot Rolled Asphalt MCHW1 Clause 1026 Performance Concrete Surface (see Note 2)	MCHW1 Clause 918 Slurry Surfacing and Microsurfacing MCHW1 Clause 922 Surface Dressing MCHW1 Clause 938 Porous Asphalt MCHW1 Clause 1026 Textured Concrete (see Note 2) MCHW1 Clause 1044 Exposed Aggregate Concrete (see Note 2)
<p>Note 1: The choice of materials has been determined by Highways England based on: the nature of the existing network; population density; traffic intensity; climatic conditions; historic performance; availability of materials; and noise requirements.</p> <p>Note 2: Rigid construction only.</p>		

E/1.2 Where an option for surface course materials is permitted with 'departure required' as shown in Table E/1.1, a departure from standard shall be required from Highways England.

E/1.3 The decision on which permitted surface course materials are selected shall be made on a site-specific basis and a record of the decision made with sufficient supporting evidence.

E/1.3.1 Where traffic speeds are lower than 50 km/h, the full range of suitable surface course materials should be considered.

NOTE 1 Traffic noise in lower speed zones is mainly attributable to engine, transmission and exhaust noise, especially from lorries.

NOTE 2 Where noise levels are high due to the intensity of high-speed traffic, surfacing materials are available that can significantly reduce tyre/road generated noise emission compared to hot rolled asphalt (HRA). These include, for example, hot, paver-laid thin surface course systems (TSCS) complying with clause 942 and some materials in clause 1026 of the Specification) MCHW1 [Ref 3.N].

E/1.3.2 HRA complying with clause 943, cold applied ultra-thin surfacings (CAUTS) complying with clause 923, concrete finished surface complying with clause 1026 and exposed aggregate concrete (EAC) complying with clause 1044 of the Specification MCHW1 [Ref 3.N] may be considered as options for the surface course unless the site is 'noise sensitive'.

Noise sensitive sites

E/1.4 Where any of the following applies, a site shall be classed as 'noise sensitive':

- 1) The location has been identified as an important area, either with or without first priority locations, in any of England's noise action plans published by DEFRA [Ref 1.N].

- 2) Noise 'sensitive receptors' are located within 600m from the roadside (and 600m from the ends of the sections). Examples of 'sensitive receptors' are given in HD 213 [Ref 1.I].
- 3) Noise barriers or earth bunds have been installed as a noise mitigation measure.
- 4) There are no designated areas of landscape or biodiversity value within 600m of the roadside (and 600m from the ends of the sections).
- 5) A noisier surface would cause unacceptable impact on non-designated areas of landscape or biodiversity value within 600m of the roadside (and 600m from the ends of the sections).

NOTE Areas of landscape or biodiversity value include areas of bird nesting or areas with multiple footpaths used regularly for recreation.

E/1.5 If the site is 'noise sensitive', a low noise surfacing shall be used.

E/1.5.1 Departure approval to use a non-low-noise surfacing may be granted if it can be demonstrated that the additional noise generated by the surfaces listed in Table E/1.1 will not have an unacceptable impact on the health and wellbeing of those living near the scheme.

NOTE Guidance on calculating the value for money of a 'noise sensitive' departure approval is provided in Appendix E/A Value for money calculation for noise.

E/1.6 The departure decision shall not be based purely on value for money.

E/1.7 HRA shall be permitted without a departure for use on bridge decks that have not been designed for a TSCS, even if the site is 'noise sensitive'.

Noise levels

E/1.8 Noise levels 0 and 1 contained in clauses 923, 942 and 1026 of the Specification MCHW1 [Ref 3.N] shall not be specified at sites with existing noise barriers or earth bunds that have been specifically installed as a noise mitigation measure or at locations that have been identified as an important area in any of England's noise action plans published by DEFRA [Ref 1.N].

E/1.8.1 CAUTS complying with clause 923 that have a declared noise level equivalent to 2 or 3 as defined in clause 942, may be used without restriction.

Texturing

E/1.9 Selected surface course materials shall comply with the relevant texture depth requirements specified in clauses 921, 942 or 1026 of the Specification MCHW1 [Ref 3.N].

E/1.10 Retexturing of existing surfaces shall require departure approval unless for small lengths (up to 200m) of pavement with a particular skidding or other safety concern.

E/2. 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	DEFRA. 'England's Noise Action Plans'
Ref 2.N	Highways England. GG 101, 'Introduction to the Design Manual for Roads and Bridges'
Ref 3.N	Highways England. MCHW1, 'Manual of Contract Documents for Highways Works (SHW) series 900 and 1000'
Ref 4.N	Highways England. CD 236, 'Surface course materials for construction'

E/3. Informative References

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

Ref 1.I	Highways England. HD 213, 'Noise and Vibration'
Ref 2.I	Department for Transport (UK). WebTAG Unit A3, 'WebTAG Unit A1.3 user and provider impacts'

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Appendix E/A. Value for money calculation for noise

E/A1 Calculation

Value for money with respect to noise abatement measures may be calculated as follows:

- 1) Benefit: cost saving of the proposed surface over 60 years, when compared to standard surface (taking into account the number of renewals anticipated over 60 years).
- 2) Cost: additional cost of noise at properties within 600m of the proposed surfaces over 60 years as defined by WebTAG Unit A3 [Ref 2.] or any update thereof.

E/A2 Noise cost

Further information on how to calculate noise cost is provided as follows:

- 1) All properties within 600m should experience the same noise change if the surface noise characteristics change.
- 2) The noise cost of a surface should increase by a maximum of £25,000 per property over 60 years for every increase of 3 dB(A), based on the July 2016 WebTAG noise valuation. This figure can be used to quickly calculate the maximum cost of additional noise in sparsely populated areas.
- 3) If a noise model is available for the scheme it can be used to accurately calculate noise exposure for each individual property, which can thereafter be used to calculate cost. If no noise model is available, existing noise exposure for properties can be estimated using DEFRA noise mapping data.

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Pavement
Design

CD 236

Northern Ireland National Application Annex to CD 236 Surface course materials for construction

(formerly HD 36/06)

Revision 3

Summary

This National Application Annex sets out the Department for Infrastructure, Northern Ireland specific requirements on surface course material options.

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 team in the Department for Infrastructure, Northern Ireland. The email address for all enquiries and feedback is: dcu@infrastructure-ni.gov.uk

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Release notes

Version	Date	Details of amendments
3	Apr 2019	Department for Infrastructure, Northern Ireland National Application Annex to CD 236. Revision 3 was no change and was issued alongside revision 3 of the core requirements document.

Foreword

Publishing information

This document is published by Highways England on behalf of the Department for Infrastructure, Northern Ireland.

This document is a National Application Annex to CD 236 [Ref 3.N].

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 National Application Annex gives the Department for Infrastructure, Northern Ireland-specific requirements related to surface course materials options.

Assumptions made in the preparation of the document

The assumptions made in GG 101 [Ref 1.N] apply to this document.

WITHDRAWN

Abbreviations

Abbreviations

Abbreviation	Definition
HRA	Hot rolled asphalt
MCHW	Manual of Contract Documents for Highway Works
NAA	National Application Annex
NMA	Noise management area
SMA	Stone mastic asphalt

Terms and definitions

Terms

Term	Definition
Departure	Variation or waiving of a requirement carried out in accordance with the Overseeing Organisation's procedures.

WITHDRAWN

NI/1. Surface course material options (CD 236, 2.1)

Choice of surfacing

NI/1.1 Surface course materials shall be selected from the permitted options provided in tables NI/1.1a, NI/1.1b, and NI/1.1c (MCHW1 [Ref 2.N]).

Table NI/1.1a : Permitted pavement surface course materials for new and maintenance construction (flexible and flexible composite construction)

				Use without restriction	Departure required
New construction or major maintenance?	Yes	High speed? (85%ile above 65 km/h)	Yes	MCHW clause 924 high friction surfacing MCHW clause 942 thin surface course system MCHW clause 910 hot rolled asphalt	MCHW clause 938 porous asphalt ¹
			No	MCHW clause 924 high friction surfacing MCHW clause 942 thin surface course system MCHW clause 910 hot rolled asphalt coated macadam	MCHW clause 938 porous asphalt ¹ Generic SMA
	No (minor)	High speed? (85%ile above 65 km/hr)	Yes	MCHW clause 922 surface dressing MCHW clause 924 high friction surfacing MCHW clause 942 thin surface course system MCHW clause 910 hot rolled asphalt	MCHW clause 938 porous asphalt ¹
			No	MCHW clause 924 High friction surfacing MCHW clause 942 thin surface course system MCHW clause 910 hot rolled asphalt coated macadam MCHW clause 922 surface dressing MCHW clause 918 slurry surfacing	MCHW clause 938 porous asphalt ¹ Generic SMA
NOTE 1 ¹ Not permitted on flexible composite construction					

Table NI/1.1b Permitted pavement surface course materials for new and maintenance construction (rigid)

				Use without restriction	Departure required
New construction or major maintenance	Yes	High speed? (85%ile above 65km/h)	Yes	MCHW clause 1044 exposed aggregate concrete	MCHW clause 1026 textured concrete
			No	MCHW clause 1044 exposed aggregate concrete	MCHW clause 1026 textured concrete
	No	High speed? (85%ile above 65km/h)	Yes	MCHW clause 1044 exposed aggregate concrete MCHW clause 910 hot rolled asphalt MCHW clause 922 surface dressing	MCHW clause 1026 textured concrete MCHW clause 938 porous asphalt MCHW clause 942 thin surface course system
			No	MCHW clause 1044 exposed aggregate concrete MCHW clause 910 hot rolled asphalt MCHW clause 922 surface dressing MCHW clause 918 slurry surfacing	MCHW clause 1026 textured concrete MCHW clause 938 porous asphalt MCHW clause 942 thin surface course system Generic SMA

Table NI/1.1c Permitted pavement surface course materials for new and maintenance construction (rigid composite)

				Use without restriction	Departure required
New construction or major maintenance?	Yes	High speed? (85%ile above 65 km/h)	Yes	MCHW clause 910 Hot rolled asphalt MCHW clause 942 thin surface course system	MCHW clause 93 8 porous asphalt
			No	MCHW clause 910 hot rolled asphalt MCHW clause 942 thin surface course system MCHW clause 922 surface dressing	MCHW clause 93 8 porous asphalt
	No (minor)	High speed? (85%ile above 65 km/h)	Yes	MCHW clause 910 Hot rolled asphalt MCHW clause 942 thin surface course system	MCHW clause 93 8 porous asphalt Generic SMA
			No	MCHW clause 910 hot rolled asphalt MCHW clause 942 thin surface course system MCHW clause 942 surface dressing MCHW clause 918 slurry surfacing	MCHW clause 93 8 porous asphalt Generic SMA

NI/1.2 Retexturing of existing surfaces shall not be carried out without departure approval.

NI/1.3 Where small lengths of pavement with a particular skidding or other safety concern are the object of proposed retexturing then departure approval shall not be unreasonably withheld.

NI/1.4 Where a materials option in tables NI/1.1a, NI/1.1b or NI/1.1c is shown in the 'departure required' column then a departure from standard shall be obtained from the Overseeing Organisation before use.

Noise management area measures

NI/1.5 Reference shall be made to the Overseeing Organisation if the site for surfacing is within 600m of a noise management area (NMA).

NI/1.5.1 Where noise levels are high due to the intensity of high-speed traffic, surfacing materials may be used that can significantly reduce tyre/road-generated noise emission compared to hot-rolled asphalt (HRA).

NOTE 1 Surfacing materials that can significantly reduce tyre/road-generated noise emission can include, for example, hot, paver-laid thin-surface course systems (TSCS) complying with clause 942 of the specification MCHW1 [Ref 2.N].

NOTE 2 Traffic noise at lower speed zones is mainly attributable to engine, transmission and exhaust noise, especially from lorries.

NOTE 3 Further information on NMAs can be obtained from the Overseeing Organisation.

NI/2. 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. GG 101, 'Introduction to the Design Manual for Roads and Bridges'
Ref 2.N	Highways England. MCHW1, 'Manual of Contract Documents for Highways Works (SHW) series 900 and 1000'
Ref 3.N	Highways England. CD 236, 'Surface Course Materials for Construction.'

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Pavement
Design

CD 236

Scotland National Application Annex to CD 236 Surface course materials for construction

(formerly HD 36/06 with IAN 156/16)

Revision 3

Summary

This National Application Annex sets out the Transport Scotland specific requirements on surface course materials options.

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 Transport Scotland team. The email address for all enquiries and feedback is: TSSStandardsBranch@transport.gov.scot

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Release notes

Version	Date	Details of amendments
3	Apr 2019	Transport Scotland National Application Annex to CD 236.

Foreword

Publishing information

This document is published by Highways England on behalf of Transport Scotland.

This document is a National Application Annex to DMRB document CD 236 [Ref 2.N].

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.

WITHDRAWN

Introduction

Background

This National Application Annex gives the Transport Scotland-specific requirements related to:

- 1) Surface course material options Section 2 of CD 236 [Ref 2.N] (former HD 36/06) - see Section S/1;
- 2) Aggregate selection: amendment to clause 3.2 and; replacement of clauses 3.10 and 3.11 of CD 236 (former HD 36/06) - see Section S/2;
- 3) Supplementary references to Section 4 and Section 5 of CD 236 [Ref 2.N] (former HD 36/06) - see Sections S/3 and Section S/4.

Assumptions made in the preparation of the document

The assumptions made in GG 101 [Ref 1.N] apply to this document.

S/1. Surface course material options

Choice of surfacing

S/1.1 Surface course materials shall be selected from those listed in Table S1.1 as permitted options.

NOTE More information on the permitted materials can be seen in the 0900 and 1000 Series of the Manual of Contract Documents for Highway Works, Volume 1 MCHW1 [Ref 3.I].

Table S/1.1N Permitted pavement surface course materials

	New construction	Maintenance
Clause 911TS Hot rolled asphalt ¹	✓	✓
Clause 918 Slurry surfacing and microsurfacing	X	ATP
Clause 922 Surface dressing ¹	X	ATP
Clause 924 High-friction surfacing	✓	✓
Clause 938 Porous asphalt	ATP	ATP
Clause 942 Thin surface course system	ATP	ATP
Clause 942TS Stone mastic asphalt surface course (TS 2010)	✓	✓
Clause 943 Hot-rolled asphalt ¹	✓	✓
Clause 1044 Exposed aggregate concrete ¹	ATP	X
NOTE: Key:		
✓	Use permitted without further approval	
ATP	ATP - 'Approval to Proceed' to be obtained from Overseeing Organisation	
X	Not permitted for use	
1 Not generally permitted within noise management areas – see Cl. 1.7		

S/1.2 Where required by Table S1.1, an 'Approval to Proceed' shall be obtained from the Overseeing Organisation for use of the material.

S/1.3 The decision on which permitted surface course materials are selected or excluded shall be made on a site specific basis.

S/1.4 A record of the decision of which permitted surface course have been considered shall be made with sufficient supporting evidence.

S/1.5 A departure shall not be required for retexturing.

- S/1.6 High friction surfacing shall be grey in colour unless colour contrast is specifically required for demarcation purposes.
- S/1.7 High friction surfacing shall not be used for the sole purpose of achieving colour contrast.
- S/1.8 942TS Stone mastic asphalt surface course shall comply with Transport Scotland Interim Amendment 35: TS2010 Surface Course Specification and Guidance TS2010 [Ref 3.N].

Noise management areas

- S/1.9 The design of maintenance and construction schemes within Scotland Noise Management Areas [Ref 4.I] shall incorporate the requirements of the Transportation Noise Action Plan [Ref 4.N] in the selection of surface course materials.
- S/1.9.1 Where traffic speeds are lower than 30mph the full range of surface course materials should be considered for use.
- S/1.9.2 Where traffic speeds are greater than 30mph, materials that are not normally permitted for use (as indicated in Cl. S/1.1) may be specified subject to departure.
- S/1.10 A submission for justification for selecting materials not normally permitted within noise management areas shall not be based solely on value for money.
- NOTE 1 *More information on Scotland Noise Management Areas can be found in the Scottish Government 'Transportation Noise Action Plan' 2014 [Ref 4.N].*
- NOTE 2 *Further advice with respect to road noise can be found in TRL report PPR 443 [Ref 2.I].*

S/2. Aggregate selection

S/2.1 Section 3.2 of CD 236 [Ref 2.N] shall not apply to TS2010 material other than for consideration prior to approval of initial stage 3 trials.

S/2.2 Section 3.10 is replaced with: Aggregate with a PSV other than those contained within CD 236 [Ref 2.N] Tables 3.2a and 3.2b shall be permitted providing it has been demonstrated that the aggregate is able to provide the required skid resistance based on previous uses of the aggregate.

S/2.3 Section 3.11 is replaced with: When aggregate with a PSV other than those contained with Tables 3.2a and 3.2b is adopted, technical and historical data along with the reasoning and justification shall be documented, as well as the methodology adopted to support the case.

NOTE One methodology usable for supporting a case for the use of lower PSV aggregates with adequate skid resistance is presented in TRL report PPR820 [Ref 1.I].

S/3. 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. GG 101, 'Introduction to the Design Manual for Roads and Bridges'
Ref 2.N	Highways England. CD 236, 'Surface course materials for construction'
Ref 3.N	Transport Scotland. TS2010, 'Surface course specification and guidance'
Ref 4.N	Scottish Government. 'Transportation Noise Action Plan 2014'

S/4. Informative References

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

Ref 1.I	TRL. TRL report PPR820, 'A procedure for justifying aggregate use based on skid resistance'
Ref 2.I	TRL. P G Abbot, P A Morgan and B McKell (AECOM). PPR 443, 'A review of current research on road surface noise reduction techniques'
Ref 3.I	Highways England. MCHW1, 'Manual of Contract Documents for Highways Works (SHW) series 900 and 1000'
Ref 4.I	Scottish Government. 'Scotland's Noise Maps'

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Pavement
Design

CD 236

Wales National Application Annex to CD 236 Surface course materials for construction

(formerly HD 36/06)

Revision 3

Summary

This National Application Annex sets out the Welsh Government specific requirements on surface course materials options.

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 Welsh Government team. The email address for all enquiries and feedback is: CustomerHelp@wales.gsi.gov.uk

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Release notes

Version	Date	Details of amendments
3	Apr 2019	Welsh Government National Application Annex to CD 236. Revision 3 was no change and was issued alongside revision 3 of the core requirements document.

Foreword

Publishing information

This document is published by Highways England on behalf of the Welsh Government.

This document is a National Application Annex to CD 236 [Ref 5.N].

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.

WITHDRAWN

Introduction

Background

This National Application Annex gives the Welsh Government-specific requirements related to surface course materials options.

Assumptions made in the preparation of the document

The assumptions made in GG 101 [Ref 3.N] apply to this document.

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Abbreviations

Abbreviations

Abbreviation	Definition
BSI	British Standards Institution
DMRB	Design Manual for Roads and Bridges
HSCA	High Stone Content Asphalt
MCHW	Manual of Contract Documents for Highway Works
SMA	Stone Mastic Asphalt

Terms and definitions

Terms

Term	Definition
Approval to proceed	Formal agreement to be obtained from the Overseeing Organisation before use, as listed in Table W/1.1.
Departure	Variation or waiving of a requirement carried out in accordance with the Overseeing Organisation's procedures.
Overseeing Organisation	The highways or roads authority of the Welsh Government and its successors.

W/1. Surface course material options (CD 236, 2.1)

Choice of surfacing

W/1.1 Surface course materials shall be selected from MCHW1 [Ref 4.N] using the permitted options provided in Table W/1.1.

Table W/1.1 Permitted pavement surface course materials for new and maintenance construction

Is the scheme within a noise priority area?	Use can be without approval	'Approval to proceed' is required
No	Clause 911W and 943 Hot rolled asphalt Clause 923 Cold-applied ultra-thin surfacing Clause 942 Thin surface course system	Clause 918 Slurry and microsurfacing Clause 922 Surface dressings SMA surface course - see Note 1 Clause 1026 Textured concrete - see Note 2 Clause 1044 Exposed aggregate concrete - see Note 2
Yes	An 'approval to proceed' is required in all cases (see Cl. W/1.2)	Clause 911W & 943 Hot rolled asphalt Clause 918 Slurry and microsurfacing Clause 923 Cold-applied ultra-thin surfacing Clause 942 Thin surface course system SMA surface course - see Note 1
Note 1: To comply the latest issue of BSI Published Document 6691 [Ref 1.N] 'Surface course specification and guidance'.		
Note 2: Rigid construction only.		

W/1.2 Where a material option in Table W/1.1 requires an 'approval to proceed', an approval shall need to be obtained from the Overseeing Organisation.

W/1.3 Materials complying with MCHW clauses 918, 922 & 923 shall only be used for maintenance purposes.

W/1.3.1 All other materials in Table W/1.1 should be considered for new constructions.

W/1.4 The choice to use a material outside or not in accordance with Table W/1.1 shall require a departure from standard.

W/1.5 Any retexturing of existing surfaces shall require an approval to proceed from the Overseeing Organisation.

W/1.6 Any use of asphalt preservation treatments, including sealants and rejuvenators, shall require an approval to proceed from the Overseeing Organisation.

Noise priority areas

W/1.7 Materials complying with MCHW clauses 911W (HSCA excluded), 922, 923 and 943 shall only be used for sites where:

- 1) the location has not been identified as a priority area in the Welsh Government's 'A noise action plan for Wales 2013-2018' published in December 2013 or any update thereof. [Ref 2.N];
- 2) no noise action priority areas are located within an envelope of 600 metres from the roadside and 600 metres from the ends of section;

- 3) the scheme is not considered noise-sensitive and has not received any noise mitigation measures;
- 4) residential areas, schools, hospitals etc. are within 600 metres of the proposed scheme.

W/1.7.1 Traffic noise at speeds <50km/h is mainly attributed to engine, transmission and exhaust noise, especially from larger vehicles and therefore, all materials should be considered.

W/2. 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. Document 6691, 'Guidance on the use of BS EN 13108 bituminous mixtures - Materials specifications'
Ref 2.N	Welsh Government. 'A noise action plan for Wales 2013-18'
Ref 3.N	Highways England. GG 101, 'Introduction to the Design Manual for Roads and Bridges'
Ref 4.N	Highways England. MCHW1, 'Manual of Contract Documents for Highways Works (SHW) series 900 and 1000'
Ref 5.N	Highways England. CD 236, 'Surface course materials for construction'

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