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Transport Infrastructure Ireland

Pavement

Tom Casey and Eddie Winterlich
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TII Standards Training 2021
16th April 2021

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Overview of Changes

Tom Casey / Eddie Winterlich

Pavement Standards Published 2020

TII Publications Number	TII Publication Title	Status	Set
AM-PAV-06045	Skid Resistance Assessment	Updated	Standards
AM-PAV-06046	Skid Resistance Management	New	Technical
CC-PAV-04011	Hot Rolled Asphalt and Coated Chippings – Checks and Key Points	New	Technical
CC-PAV-04013	Surface Dressing – Checks and Key Points	New	Technical
CC-PAV-04014	Stone Mastic Asphalt – Checks and Key Points	New	Technical
CC-PAV-04015	Asphalt Concrete – Checks and Key Points	New	Technical
CC-PAV-04021	The Technical Delivery of Minor Pavement Schemes	New	Technical
DN-PAV-03023	Surfacing Materials for New and Maintenance Construction, for Use in Ireland	Updated	Standard

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Skid Resistance Standard & Policy

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Philosophy for changes

- AM-PAV-06045-01 (HD28/11) – single document, review was required
- Separate “Standard” issues from “ Policy” issues – develop two documents
- Review Site Categories and ILs based on experience and research
- Update approach to urban environments based on experience
- Review approach to identifying sites for site investigation
- Achieve consistent approach to site inspection reports
- Move from a concept of risk equalisation to a concept of friction demand and friction supply

Philosophy for changes

- Align underlying theories with current research
- Incorporate outputs from TII Research Projects
  - Risk Based Geometric Design - RibGeom (RE-GEO-01108)
  - Raman Spectrometry
  - Friction After Polishing (FAP)
  - Detailed investigation/materials analysis of HD28 sites
  - Visual assessment and 3D CRP procedures for HRA (Series 900 & CC-PAV-04010)

Philosophy for changes

- Incorporate outputs from TII Research Projects cont'd
  - Research of skid resistance on Bends and Roundabouts
  - Review of approach to adjusting skid data for seasonal variation
  - Review of speed correction methods
  - Review of Traffic definition, and how low and high traffic are defined
  - Development of Site Scoring Model for identifying and prioritising sites for inspection
  - Update Site Inspection report template
  - Development of New App (Survey 123 app) for conducting site inspections
  - Develop HD28 Training Course for new Standard & Policy documents

Overview of AM-PAV-06045 (Standard)

- Supersedes HD28/11 (November 2011)
- How measurements of skid resistance are to be made and interpreted
- Measuring skid resistance, processing data, setting appropriate Investigatory Levels (ILs)
- Data processed to derive Characteristic Skid Coefficient (CSC) values
- CSC values compared with the predetermined ILs to identify lengths of road where the skid resistance is at or below the IL

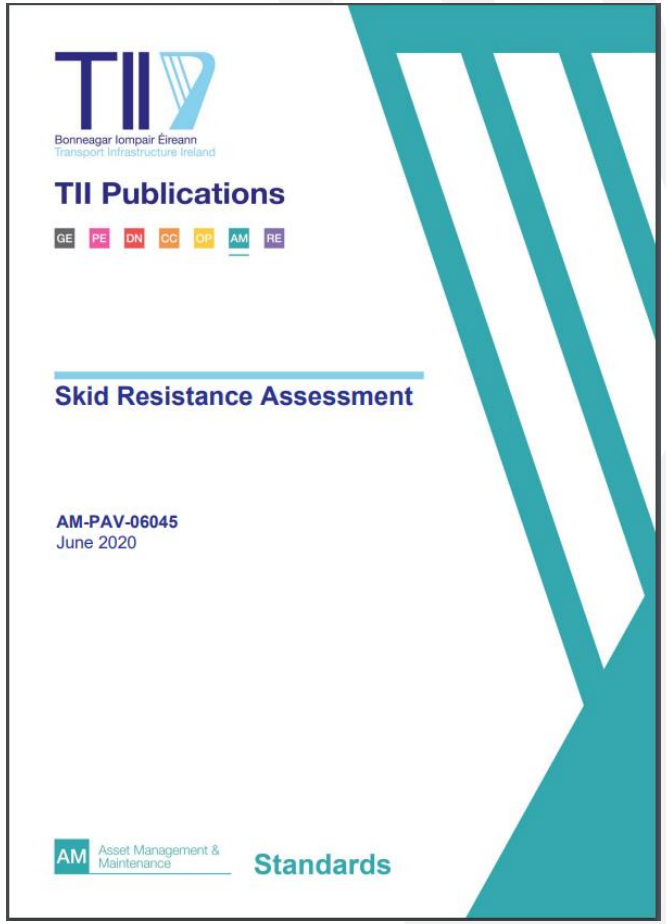


Table 5.1: Site Categories and Investigatory Levels

Site Category and Definition		Investigatory Levels for CSC data (Characteristic Skid Coefficient data speed corrected to 50km/h and seasonally adjusted)						
Rural Site Categories (> 60km/h)		0.30	0.35	0.40	0.45	0.50	0.55	0.60
A	Motorway							
B	Non-event carriageway with one-way traffic							
C	Non-event carriageway with two-way traffic							
Q	Approaches to and across major and minor junctions, Approaches to roundabouts (see note 5)							
K	Approaches to traffic signals, pedestrian crossings and railway crossings (see note 5)							
R	Roundabout (see note 6)							
G1	Gradient 5-10% longer than 50m (see note 7)							
G2	Gradient >10% longer than 50m (see note 7)							
S1	Bend radius <250m – carriageway with one-way traffic							
S2	Bend radius <250m – carriageway with two-way traffic							
Urban Site Categories (≤ 60km/h)		0.30	0.35	0.40	0.45	0.50	0.55	0.60
U1	Approaches to traffic signals, pedestrian crossings and railway crossings (see note 5)							
U2	All other urban locations							

AADF ≥ 2500

AADF < 2500

Table 5.1: Site Categories and Investigatory Levels

Main Changes

- Description of Site Categories B & C changed
  - B: Dual carriageway non-event → Non-event carriageway with one-way traffic
  - C: Single carriageway non-event → Non-event carriageway with two-way traffic

- Description of Site Category Q updated
  - Q: Approaches to and across major and minor junctions → Approaches to and across major and minor junctions, Approaches to roundabouts

- Description of Site Category K updated
  - K: Approaches to traffic signals, pedestrian crossings → Approaches to traffic signals, pedestrian crossings and railway crossings

- IL lowered for Site Category R (Roundabouts)
  - R: from 0.45 & 0.50 → 0.40 & 0.45

Table 5.1: Site Categories and Investigatory Levels

Main Changes (Cont'd)

- **New Urban Site Categories, U1 and U2**
  - U1: Approaches to traffic signals, pedestrian crossings and railway crossings (0.50 & 0.55)
  - U2: All other urban locations (0.35 & 0.40)

- **Traffic**
  - High and low traffic now based on veh/lane/day (AADF) and no longer cv/l/d

- **Note 6:** For site category R, a site assessment is only triggered where 50% or more of the 10m lengths on the roundabout are at or below IL. (Previously, a roundabout was triggered is any 10m length was at or below IL).

- **Note 7:** Categories G1 and G2 should not be applied to uphill gradients on carriageways with one-way traffic.

Overview of AM-PAV-06046 (Policy)

Policy Document

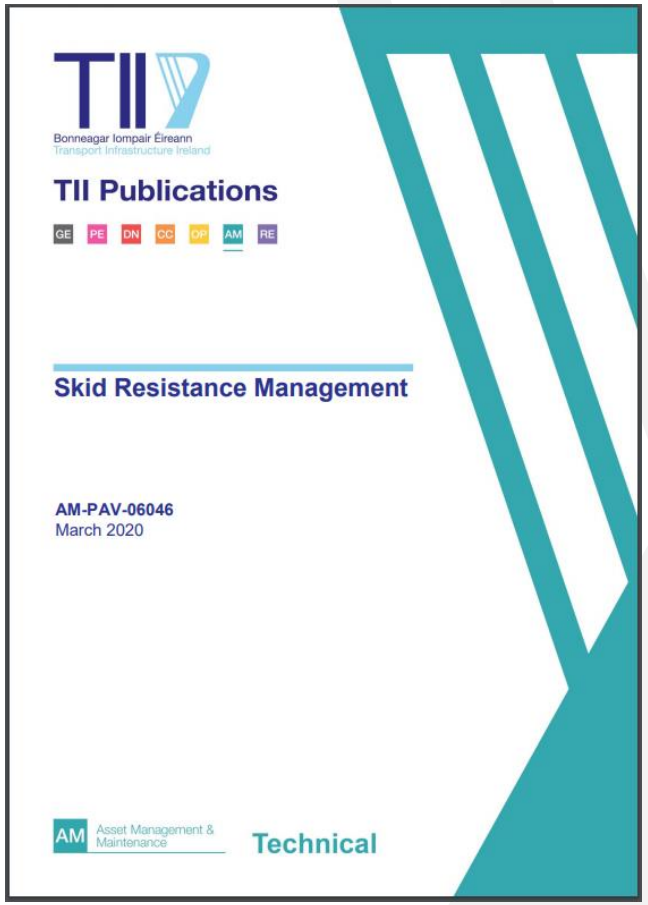
– TII policy for managing skid resistance on in-service national roads

Objectives

– Manage the risk of skidding collisions in wet conditions

– Provide a consistent approach to the management of skid resistance

– Maintain appropriate skid resistance for the road environment at each location



Overview of AM-PAV-06046 (Policy)

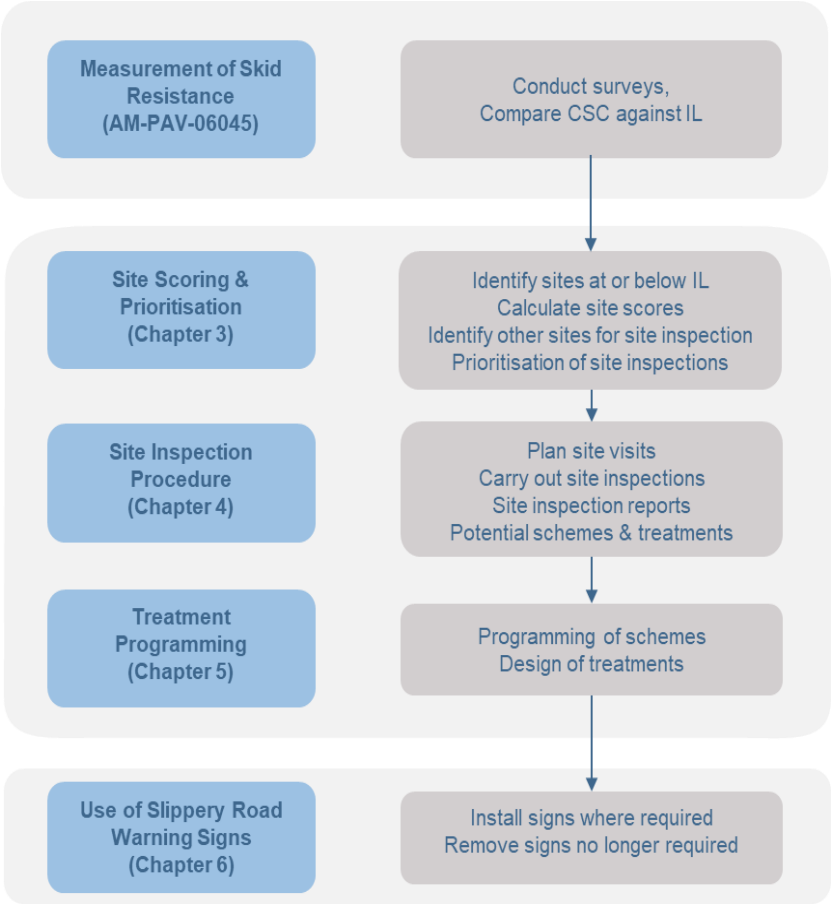


Figure 2.1 Operation of AM-PAV-06046 Management of Skid Resistance

Principal Updates

Site Scoring & Prioritisation

- Review the Data (Desktop Study)
- Assess the requirement and priority for site inspection (Scoring Model)
- Skid resistance difference, collision history, surface texture, geometry (RibGeom)

Site Inspection Procedure

- To assess the requirement for remedial action(s)
- Visual assessment
- Friction demands by road users
- Local judgement of site-specific factors

Overview of AM-PAV-06046 (Policy)

Collate Data

- **Skid resistance Difference**
- **Collision History**
- **Surface Texture**
- **RibGeom risk rating**

→ **Scoring Model**

- PAMS DATA: IRI, RUT DEPTH, LPV, GEOMETRICS (IF RELEVANT)
- COLLATED AND ASSESSED FOR EACH AVERAGING LENGTH

Identify Sites for Site Inspection: Scoring Model

Input Parameter	Criteria and Scores						
Skid resistance Difference *(SD)*	0	-0.01 to -0.03	-0.04 to -0.06	-0.07 to -0.09	-0.10 to -0.12	-0.13 to -0.15	< -0.15
Score	**0**	**2**	**4**	**6**	**8**	**10**	**12**
Number of collisions for the latest three years where SD ≤ 0	0	1	2		3		4+
Score	**0**	**3**	**6**		**9**		**12**
Surface texture *(MPD)* where SD ≤ 0	> 0.8 mm		0.6 mm to 0.8 mm		< 0.6 mm		
Score	**0**		**1**		**3**		
Risk rating (*RibGeom*)	≤ 0.9		> 0.9 and ≤ 0.995		> 0.995		
Score	**0**		**1**		**3**		

Method:

- Sum the scores for the individual parameters for each Averaging Length within the Site
- The Site Score is the Max. Averaging Length Score within each Site
- Site Score ≥ 6?

- Site Inspection

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‘Checks & Key Points’ Guides

Tom Casey / Eddie Winterlich

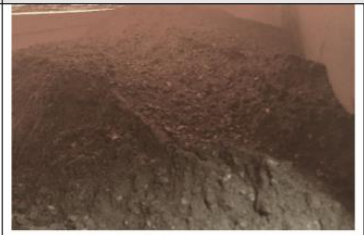
‘Checks & Key Points’ Guides

- A number of ‘Checks & Key Points’ guides have been developed and published to date by TII
- Provides ERs and other interested parties with background information on key attributes for the installation of various products on pavement schemes
- Intended to enhance the understanding of the written requirements of the specifications

TII Publications Number	TII Publication Title	Status	Set	Publication Date
CC-PAV-04011	Hot Rolled Asphalt and Coated Chippings – Checks and Key Points	New	Technical	January 2019
CC-PAV-04013	Surface Dressing – Checks and Key Points	New	Technical	March 2020
CC-PAV-04014	Stone Mastic Asphalt – Checks and Key Points	New	Technical	March 2020
CC-PAV-04015	Asphalt Concrete – Checks and Key Points	New	Technical	December 2020

‘Checks & Key Points’ Guides

- Photographs and notes used to emphasise the points being made
- Photographs aim to show examples of good practice and poor practice

Key point	Level	Example Photographs	Specification References and notes
HRA Mixture	Good Mixture sits up in peaks in paver hopper indicating good bearing capacity Screed able to maintain level and float on the HRA without displacement	 	The composition of the HRA mixture should be sufficiently robust to support the coated chippings and sufficiently malleable to hold the coated chippings in place. The manufacturing process can also play a significant role in the ability of the HRA mixture to support the coated chippings. The temperature of the HRA mixture should be within the limits contained in Tables 5 and 6 of CC-SPW-00900. Insulated transport is essential to minimise heat loss prior to use. CC-SPW-00900 Clause 10.1.3 stipulates the requirements for transport. Particularly wet or cold ambient conditions can affect the ability of the HRA mixture to support the coated chippings. Paver tamper settings can be altered to assist the process of supporting the coated chippings. Truck inspections on site should only take place if hopper material or screed indicates poor bearing capacity.
	Poor Mixture is level in paver hopper indicating poor bearing capacity Screed struggles to maintain level and will require screed assist to stop displacement	 	

‘Checks & Key Points’ Guides

Checklist of items required prior to commencing design

Surface Dressing: Site Assessment, Road Hardness, Macrotexture, Traffic Volume, Traffic Speed, Chippings, Season

Checklist of items required prior to commencing works

- CE Marking (HRA, SMA, AC)
- Constituents, Product Composition, Chippings (SD)
- Works Proposals

Checklist of items required during and after completion of the works

- Works Requirements
- Monitoring of Construction

‘Checks & Key Points’ Guides

‘Key points’ during and after completion of the works

Hot Rolled Asphalt (CC-PAV-04011):

- HRA Mixture, Chip Condition, Size, Macrotexture, Rate of Spread, Embedment, Joints, Weather, Chip loss, Ride quality

Surface Dressing (CC-PAV-04013):

- Aggregates, Design Checks, Stockpile Management, Binder Emulsion Storage, Equipment, Weather, Substrate, Installation, Traffic Control & Aftercare, Specific Issues

‘Checks & Key Points’ Guides

‘Key points’ during and after completion of the works

Stone Mastic Asphalt (CC-PAV-04014):

- SMA Mixture, Surface Finish, Transport, Material Flow, Preparation, Bond to Substrate, Macrotexture, Joints, Roundabouts, Ironwork, Weather, Ride Quality, Site Illumination

Asphalt Concrete (CC-PAV-04015):

- AC32 Base Mixture, AC20 Binder Mixture, Transport, Preparation, Bond to Substrate, Joints, Freestanding Edge, Adjacent Concrete Component, Ironwork, Temperature, Regularity, Specific Issues

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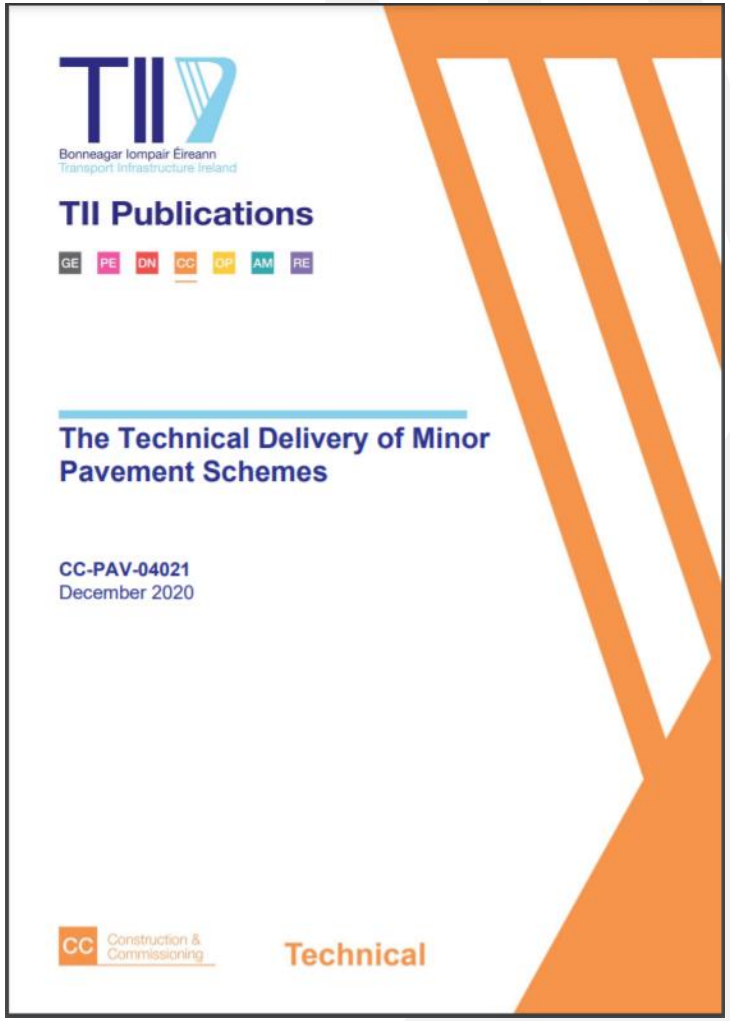
The Technical Delivery of Minor Pavement Schemes

Tom Casey / Eddie Winterlich

The Technical Delivery of Minor Pavement Schemes (CC-PAV-04021)

- New technical document published in december 2020
- Serves as the starting point for the practitioner for the technical delivery of minor pavement schemes.
- Provides the steps to take including references to existing tii publications necessary to deliver a scheme
- Hyperlinks to relevant TII standards and technical information
- Helps in locating and interpreting the requirements



The Technical Delivery of Minor Pavement Schemes (CC-PAV-04021)

- Using the Document – 4 Column Headings

Stage

- Chronological order in which the documents are required to be accessed in order to address each aspect of the scheme delivery

Document

- Contains the TII document reference; for ease of reference, this is also a hyperlink to the document on the TII Publications website

Document Section

- Contains the specific location within the TII document that provides the detail needed to address the Stage

Deliverable

- Where required, the expected outcome from reviewing the TII document is referred to in this column. This deliverable will usually form part of the series of documents necessary to deliver the scheme.

The Technical Delivery of Minor Pavement Schemes (CC-PAV-04021)

Stage	Document	Document Section	Deliverable
Pavement type			
What is required: A or B?			Pavement layers to be constructed and pavement type to be used
A. New pavement being constructed	DN-PAV-03021	Sec 1.10	
B. Existing pavement requiring maintenance treatment	AM-PAV-06050 DN-PAV-03021	Sec 6 & 7 Sec 1.12	
Consider pavement types: Flexible Composite	GE-PAV-01006 DN-PAV-03021 DN-PAV-03021	Sec 2.5 Sec 8.1 Sec 8.18	
Consider product options	DN-PAV-03074	Contents	
Is departure from Standard required?	DN-PAV-03021	Sec 1.5	Apply for Departure
Traffic assessment			
Calculation of design traffic Calculating traffic flow Existing pavement: permanent traffic counter (TMU) or scheme specific count	PE-SMG-02002 PE-PAG-02038 www.nratrafficdata.ie		Design traffic in msa for carriageway lanes
Foundation assessment			
Determine sub grade CBR	DN-PAV-03021	Sec 3.16	
In Situ Dynamic Cone Penetrometer testing	DN-PAV-03021	Sec 3.59	Test Results
Sub grade improvements necessary?	Flexible DN-PAV-03021 Composite DN-PAV-03021	Sec 4.10 Sec 5.10	Foundation layer requirements
Unbound Material			
Capping & Subbase layer thickness	Flexible: DN-PAV-03021 Composite: DN-PAV-03021	Sec 4.10 Sec 5.10	Capping & Sub base layer requirements
Capping layer type	DN-PAV-03021 & CC-SPW-00600	Sec 3.32 Cl 613	
Subbase layer type	DN-PAV-03021 & CC-SPW-00800	Sec 3.36 Cl 801	
Bound Material – General			
Product properties	DN-PAV-03024	Sec 2.3 & 2.4	
Flexible: Combined asphalt layers thickness	DN-PAV-03021	Sec 4.15	Total pavement thickness required
Composite: HBM Base and asphalt thickness	DN-PAV-03021 DN-PAV-03074	Sec 5.15 Sec 2.3.4	
Bound Material – Base			
Choosing a Base material	DN-PAV-03024	Sec 3.4	Base layer requirements
Flexible: Asphalt	CC-SPW-00900	Cl 3	
Composite: Hydraulically Bound Mixture	CC-SPW-00800	Cl 810	

Stage	Document	Document Section	Deliverable
Bound Material – Binder course			
Choosing a Binder material	DN-PAV-03024	Sec 3.3	Binder layer requirements
Flexible & Composite: Asphalt	CC-SPW-00900	Cl 3 (AC) & Cl 5 (SMA)	
Bound Material – Surface course or treatment			
Choosing a Surfacing material Permitted options	DN-PAV-03024 DN-PAV-03023	Sec 3.2 Table 2.1	Surface layer requirements
Consider differing needs: Carriageway(s) / cycleway / footway	Carriageway DN-PAV-03023 Cycleway DN-GEO-03047 Footway DN-PAV-03026	Sec 2.2	
Choose PSV & AAV of aggregate in Surface	DN-PAV-03023	Table 3.1 & Table 3.2	Aggregate Properties
Flexible & Composite: Asphalt or Treatment	CC-SPW-00900		
Product Approval			
Conformity of Bituminous mixtures	DN-PAV-03074 CC-SPW-00900	Sec 2.4 Cl 1.2	
HFS, LEBM, Retexturing, PRMS, LRMS	DN-PAV-03075		
Contract documents			
Specification Appendices (as required):	CC-GSW-00700		Contract Documents for Tender
Particular Requirements for Bituminous Bound Materials		Table NG 7/1	
Particular Requirements for Unbound and Cement Bound Mixtures		Table NG 7/2	
Permitted pavement options		Appendix 7/1	
Surface Dressing Product (End Performance)		Appendix 7/3	
Bituminous Sprays		Appendix 7/4	
Road Construction Details		Appendix 7/5	
Breaking up redundant pavement		Appendix 7/6	
Cold Milling (Planing)		Appendix 7/9	
Microsurfacing		Appendix 7/10	
High Friction Surfacing		Appendix 7/11	
Low Energy Bound Mixtures		Appendix 7/12	
Recipe Surface Dressing		Appendix 7/21	
Testing to be carried out by the Contractor		Appendix 1/5	
Samples to the Employer's Representative	CC-GSW-00100 CC-GSW-00100	Appendix 1/6	

The Technical Delivery of Minor Pavement Schemes (CC-PAV-04021)

Stage	Document	Document Section	Deliverable
Documentation check	DN-PAV-03074	Sec 1.2	Cross check
Works			
In accordance with	CC-SPW-00900 CC-SPW-00700	Sec 10	
Works assistance			
Hot Rolled Asphalt Checks and Key Points Stone Mastic Asphalt Checks and Key Points Surface Dressing Checks and Key Points Asphalt Concrete Checks and Key Points	CC-PAV-04011 CC-PAV-04014 CC-PAV-04013 CC-PAV-04015		

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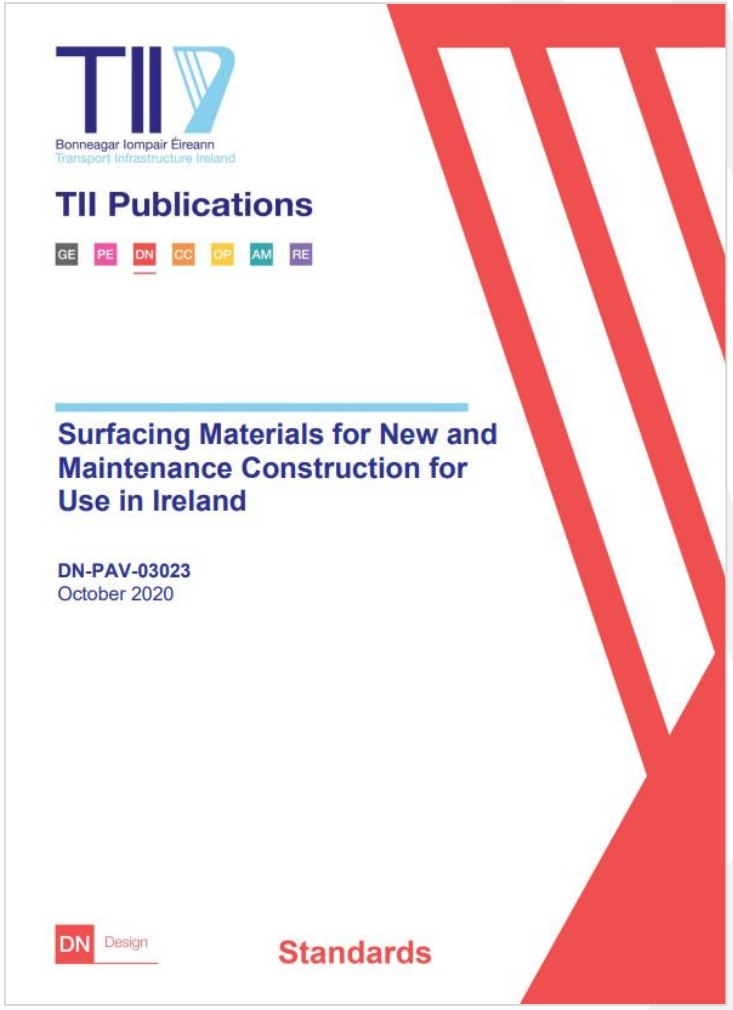
DN-PAV-03023
Surfacing Materials for New and Maintenance Construction for Use in Ireland

Tom Casey / Eddie Winterlich

Updates Required

- Revision of DN-PAV-03023 (HD36) published in October 2020.
- Document updated to latest format / structure
- Align with changes to related standards e.g. AM-PAV-06045
- Registration of Aggregate Products for Use in Surfacings



Document updated to latest format / structure

- Table of Definitions and Abbreviations

- Sections and subsections – no clauses

2. Surfacing Options

2.1 Background

The choice of surfacing materials/systems plays a vital role in providing roads that meet the needs of the user, are safe and give value for money. For many years hot rolled asphalt with chippings rolled into the surface was the most widely used surfacing on National Roads, including motorways, for both

- Background information moved to Appendices e.g. information on texture and skid resistance

Align with changes to related standards e.g. AM-PAV-06045

Table 3.1 Minimum PSV of Chippings, or Coarse Aggregate in Unchipped Surfaces, for new Surfacings

Site category and Definition (see AM-PAV-06045)		Minimum PSV required for given traffic level and type of site						
		Annual Average Daily Flow (AADF) at opening						
		<2500	2501-5000	5001-7500	7501-10000	10001-20000	20001-30000	Over 30000
Speed Limit > 60km/h								
A	Motorway	55	55	55	60	60	60	60*
B	Non-event carriageway with one-way traffic	55	55	60	60	60	60	60*
C	Non-event carriageway with two-way traffic	60	60	60	60	65	65	68+
Q	Approaches to and across major and minor junctions, Approaches to roundabouts	60	60	65	65	68+	68+	68+
K	Approaches to traffic signals, pedestrian crossings and railway crossings	65	65	68+	H / 70+	H / 70+	H / 70+	H / 70+
R	Roundabout	60	65	65	68+	68+	68+	68+
G1	Gradient 5-10% longer than 50m	60	60	60	65	65	68+	68+
G2	Gradient >10% longer than 50m	60	60	60	65	65	68+	68+
S1	Bend radius <250m – carriageway with one-way traffic	60	65	65	68+	H / 70+	H / 70+	H / 70+
S2	Bend radius <250m – carriageway with two-way traffic	60	65	65	68+	H / 70+	H / 70+	H / 70+
Speed Limit ≤ 60km/h								
U1	Approaches to traffic signals, pedestrian crossings and railway crossings	65	65	68+	H / 70+	H / 70+	H / 70+	H / 70+
U2	All other urban locations	60	60	60	60	65	65	68+

Align with changes to related standards e.g. AM-PAV-06045

- Updated Site Categories, speed limits
- PSV and AAV determination by Annual Average Daily Flow (AADF) instead of count of Commercial Vehicle (CV)
- Adjustments to PSV requirements for some Site Category / AADF combinations
- Investigatory Levels redundant - removed

Registration of Aggregate Products for Use in Surfacings

- Coarse Aggregates only
- Assist with ensuring characteristics of aggregates at their natural source align with those of material placed on site
- Evaluation of Conformity
  - Geometrical
  - Physical
  - Durability
  - Chemical
  - Geological Assessment
  - Petrographic Assessment
- Factory Production Control

Registration of Aggregate Products for Use in Surfacings

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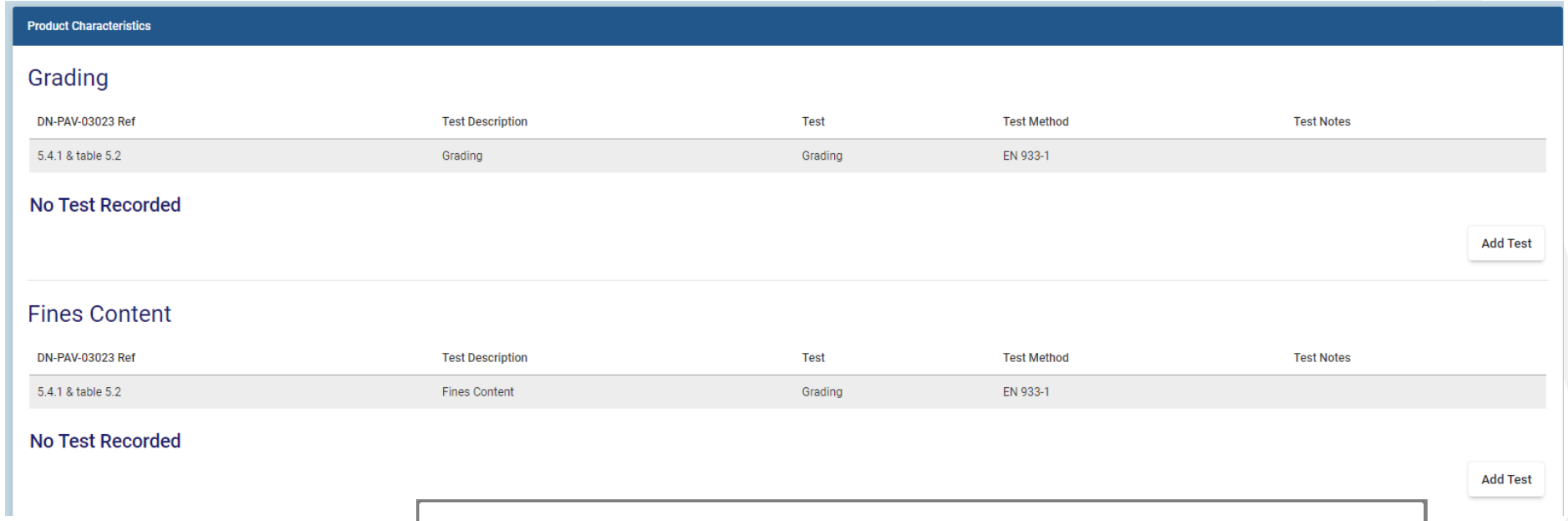
AGGREGATE REGISTER CURRENTLY MS EXCEL BASED

PRODUCT CHARACTERISTICS		Cells in yellow require user inputs						
Product Size (According to end use)	20/14							
Information	**DN-PAV-03023 Reference**	**Test description**	**Test**	**Test method**	**Test Notes**	**Date of Latest Tests**	**Declared Value (select from dropdown)**	**Latest Test Certificate(s) Submission Document Reference**
Geometrical	5.4.1 & Table 5.2	Grading	Grading	EN 933-1			GC 85/20	
		Fines content	Grading	EN 933-1			fDeclared	
		Particle shape	Flakiness	EN 933-3			FI35	
Physical Characteristics	5.4.2 & Table 5.2	Resistance to fragmentation	Los Angeles coefficient	EN 1097-2			LADeclared	
		Particle Density	Density	EN 1097-6			2.54 Mg/m3	
		Water absorption	Water Absorption	EN 1097-6			1.50%	
		Resistance to polishing	Polished Stone Value	EN 1097-8	The same bulk sample shall be used to obtain the sub samples for AAV, PSV, FAP and geological assessment tests.		PSVDeclared	
		Resistance to surface abrasion	Aggregate Abrasion Value	EN 1097-8	The same bulk sample shall be used to obtain the sub samples for AAV PSV and FAP and geological assessment tests.		AAVDeclared	
		Friction after polishing	Performed on aggregate mosaic	EN 12697-49 & Annex A	The same bulk sample shall be used to obtain the sub samples for AAV PSV and FAP and geological assessment tests.		FAPmin36	
Durability	5.4.3 & Table 5.2	Resistance to weathering	Magnesium sulfate soundness	EN 1367-2			MSDeclared	
Chemical & Geological classification	5.4.4.1 & Table 5.2	Geological assessment of raw material	Identify and map lithologies and proportions	I.S. EN ISO 14689-1 & see 5.4.4.1	Quarry deposit		Required information to be complied within reports submitted.	
	5.4.4.2 & Table 5.2	Geological examination of the finished product	Identify lithologies and proportions	I.S. EN ISO 14689-1 & EN 932-3 & see 5.4.4.2	The same bulk sample shall be used to obtain the sub samples for AAV PSV and FAP and geological assessment tests.			
	5.4.4.3 & Table 5.2	Petrographic assessment of the finished product	Thin sections	BS 812: Part 104 & ASTM C295 & see 5.4.4.3				

Registration of Aggregate Products for Use in Surfacings

Aggregate Register future web-based



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Thank You