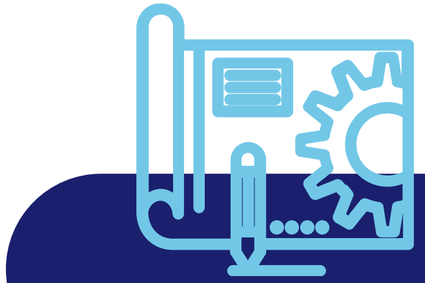
Transport Infrastructure Ireland

Update on recent developments in Pavement Standards & Specifications



Kevin Crawley – June 2025

Updates to Pavement Standards & Specifications

In the last 12 months

MAY 2024

DN-PAV-03022
Irish Analytic Pavement Design Method (IAPDM) User Guide

DN-PAV-03077
Complementary Product Category Rules for Bituminous Mixtures (c-PCR Bituminous Mixtures)

SEPT 2024

CC-PAV-04018
Investigating Unexpected Skid Resistance Performance of Bituminous Surface Course Materials

AM-PAV-06046
Skid Resistance Management for National Roads

NOV 2024

DN-PAV-03060
Test Method for the Structural Evaluation of Road Pavements

DN-PAV-03061
Guidelines for the Structural Evaluation of Road Pavements

CC-GSW-00800
Notes for Guidance on the Specification of Works – Road Pavements – Unbound and Hydraulically Bound Mixtures

MAY 2025

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

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DN-PAV-03022

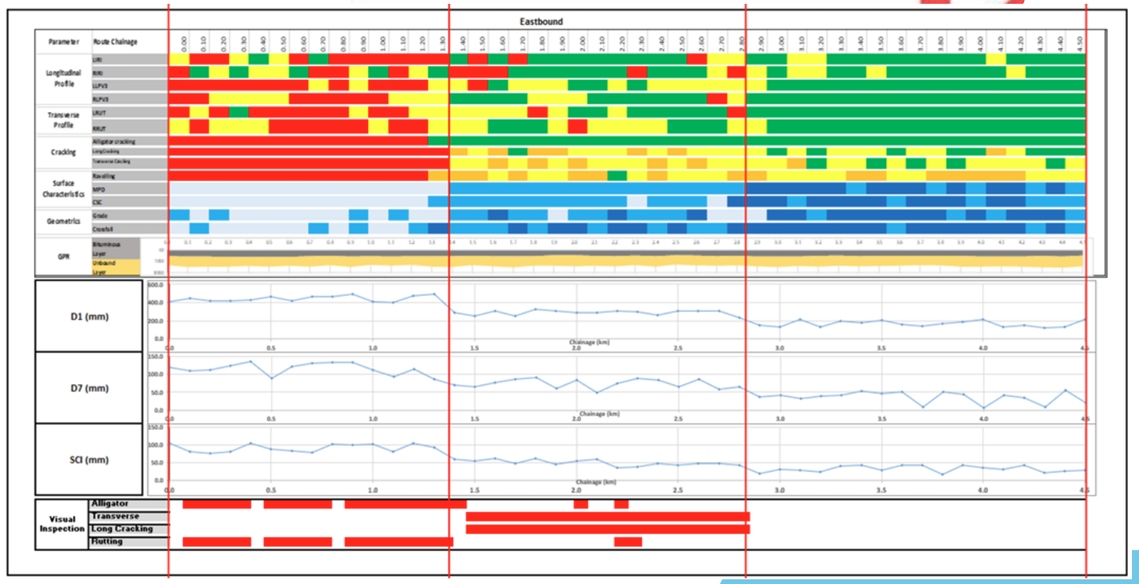
Irish Analytic Pavement Design Method (IAPDM) User Guide

DN-PAV-03022

Irish Analytic Pavement Design Method (IAPDM) User Guide

Content Includes:

- Overview of IAPDM Software (should be read in conjunction with DN-PAV-03021)
- Provides Worked Examples
  - ✓ New Construction
  - ✓ Existing Pavement Strengthening (Overlay & Inlay)
  - ✓ Calculate Design Traffic
  - ✓ Pavement Type & Materials (Design Level 1)
  - ✓ Subgrade Characterisation
  - ✓ Determine Layer Thickness
  - ✓ Pavement Design using Design Level 2 materials
- Example of extended scheme strip maps
- For access email iapdm@tii.ie
- Next online IAPDM tutorial – 26th June 2025



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DN-PAV-03060 & DN-PAV-03061

Test Method for the Structural Evaluation of Road Pavements

&

Guidelines for the Structural Evaluation of Road Pavements

DN-PAV-03060 & DN-PAV-03061

Test Method & Guidelines for Structural Evaluation of Pavements

Overview of the publications

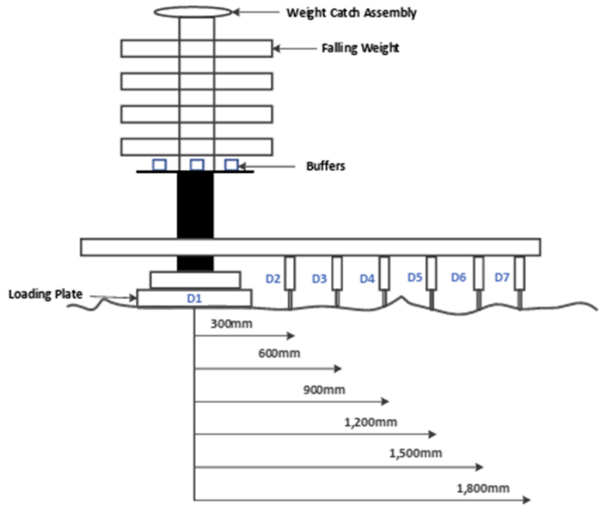
- DN-PAV-03060
  - Describes the requirements for carrying out structural evaluation of road pavements and how measurements are to be collected on flexible and flexible/composite road pavements.
- DN-PAV-03061
  - Sets out further guidance on the use, analysis and interpretation of Falling Weight Deflectometer (FWD) data.
- These are both new documents which replace the following:
  - CC-GSW-04008 Guidelines for the Use of the Falling Weight Deflectometer in Ireland
  - CC-GSW-04009 Falling Weight Deflectometer Setup and Quality Assurance for Works Performance Assessment of Unbound Granular Mixtures

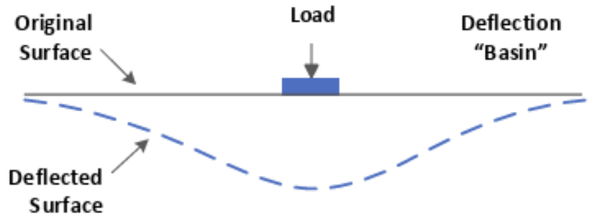
DN-PAV-03060 & DN-PAV-03061

Test Method & Guidelines for Structural Evaluation of Pavements

Benefits of new documents:

- Provides standardisation of FWD measurement procedures
  - Test method for performance assessment of UGM
  - Test method for structural evaluation of existing and new pavement schemes
- Sets out Accreditation & Calibration Procedures
- Provides consistency of approach and best practice on deflection testing of existing and new pavement structures.
- Defines data analysis and reporting of FWD deflection measurements
- Describes the methods recommended for assessing pavement layer thickness, for use in the analysis of FWD deflection data.
- Provides guidance on pavement construction information including for GPR
- Sets out requirements for back-calculation, layer stiffness evaluation and input to IAPDM





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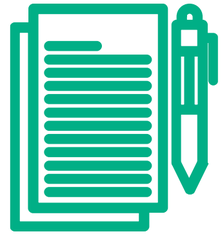
CC-GSW-00800

Notes for Guidance on the Specification of Works – Road Pavements – Unbound and Hydraulically Bound Mixtures

CC-GSW-00800

Notes for Guidance on the Specification of Works – Road Pavements – Unbound and Hydraulically Bound Mixtures

Key Changes/Updates & Benefits



- Document alignment with the structure of the specification CC-SPW-00800
- Further guidance on CE marking and application of non-harmonised standards
- Updated referencing to new material categorisation ie. UGM and HBM
- Detailed background to water soluble sulphate and oxidisable sulphides assessment

- Provides guidance to promote TII sustainability goals e.g. reuse of reclaimed asphalt (RA) in bituminous layers rather than UGM or HBM and when RA should be used in UGM or HBM.
- Clarification on Environmental requirements and regulations
- Guidance on performance-based specification and works testing

CC-PAV-04018

Investigating Unexpected Skid Resistance Performance of Bituminous Surface Course Materials

CC-PAV-04018

Investigating Unexpected Skid Resistance Performance of Bituminous Surface Course Materials

Context:

- Issues pertaining to surface course durability and unexpected skid resistance performance occurring on the network
- Can occur shortly after scheme opening to traffic or sometimes much later, i.e. 1 to 2 years after opening or later
- Not always apparent at the time of installation
- Identification of issues through:
  - TII Annual Network Pavement Surveys
  - Inspections by ER
  - Notification of sites to TII NM though other sources, e.g. by LAs
- These issues are not confined to any one region or geographical location
- Detailed investigation of surface course performance required!

CC-PAV-04018

Investigating Unexpected Skid Resistance Performance of Bituminous Surface Course Materials

Procedure:

Process Element	Tasks	Relevant TII Publications
Collect Documentation	• Completion of Annex A: Documentation Checklist, to assess the availability of documentation, materials certification and test results for the materials used in the Works • Contractor's Quality Submission • Product Approvals (CE Marking, Type Test Reports, Declaration of Performance) • Declared Source(s) • Works Proposals • QA/QC Test Records • As-Built Records/Close-Out Reports	DN-PAV-03023 Surfacing Materials for New and Maintenance Construction for Use in Ireland DN-PAV-03024 Bituminous Mixtures, Surface Treatments, and Miscellaneous Products and Processes DN-PAV-03074 Design of Bituminous Mixtures, Surface Treatments, and Miscellaneous Products and Processes CC-SPW-00900 Road Pavements - Bituminous Materials CC-GSW-00900 Notes for Guidance on CC-SPW-00900 Road Pavements – Bituminous Materials CC-PAV-04011 Hot Rolled Asphalt and Coated Chippings – Checks and Key Points CC-PAV-04013 Surface Dressing – Checks and Key Points CC-PAV-04014 Stone Mastic Asphalt – Checks and Key Points CC-PAV-04015 Asphalt Concrete – Checks and Key Points CC-PAV-04016 Site Documentation & Traceability of Bituminous Mixtures – Checks and Key Points
Review Documentation	• Review and gap analysis of the collected documents and information • Assess the level of compliance with applicable TII Specifications and Standards, and Works Requirements. • Assess the traceability of materials used in the Works • Compile and document findings on documentation review and gap analysis	
Site Survey Data	• Collate and assess available pavement condition data since construction, including skid resistance and texture depth data • Conduct site-specific surveys including SCRIM and RSP/LCMS to assess current condition of the road surface • Visual Assessment of the site with photos • Collate and review records of any collisions since construction • Retrieve AM-PAV-06046 investigation records and review findings • Compile and document the results of the site survey data analysis	AM-PAV-06045 Skid Resistance Assessment AM-PAV-06046 Skid Resistance Management AM-PAV-06049 Pavement Asset Repair and Renewal - Scheme Approval Procedures AM-PAV-06050 Pavement Assessment Repair and Renewal Principles AM-PAV-06060 Pavement Asset Management Guide
Other Site Surveys (if required)	• Macrotexture testing using Volumetric Patch Technique • Visual inspection for assessment of chip distribution and positive/non-positive texture (specific to HRA) • Texture Characterisation using 3D CRP and/or 1mm LCMS (specific to HRA) • Traffic surveys • Geometric risk analysis	CC-SPW-00900 Road Pavements - Bituminous Materials CC-GSW-00900 Notes for Guidance on CC-SPW-00900 Road Pavements – Bituminous Materials CC-PAV-04010 The Use of Close Range Photogrammetry to Characterise Texture in a Pavement Surfacing Material RE-PAV-00003 Characterising Texture & Chip Distribution in Hot Rolled Asphalt using 3D Modelling Techniques RE-GEO-01108 Risk-Based Geometric Design for Road Improvements
Sampling of Materials	• Obtain any retained samples of the constituent materials or mixed materials from the source quarry or from the Works • Obtain samples of the materials representative of those laid in the Works by extraction of cores and/or slabs	CC-PAV-04017 Sampling, Storage and Retention of Bituminous Mixtures – Checks and Key Points
Materials Testing and Analysis	• Where retained samples of constituent aggregates are available, determine the PSV and AAV and compare against declared properties • Where retained samples of mixed material are available, determine the mixture composition and compare against declared properties • Conduct Geological and Petrographic analysis on retained and/or recovered samples for identification and distribution of rock type(s) and microtexture roughness for the coarse aggregate and fine aggregate in SMA and PCC in HRA, and compare against declared sources/properties	DN-PAV-03023 Surfacing Materials for New and Maintenance Construction for Use in Ireland AM-GEN-00003 Approach to Skid Resistance and Related Research 2011 to 2021
Reporting	• Summarise the findings from documentation review, site survey data analysis, sample recovery and testing • Prepare an investigation Compendium Report with executive summary, factual outputs and findings of the investigation • Provide recommendations based on the investigation findings	

CC-PAV-04018

Investigating Unexpected Skid Resistance Performance of Bituminous Surface Course Materials

Appendix A – Document Checklist:

Item	Specification Reference	#	Check (Y/N)	✓
Selection of Aggregate	DN-PAV-03023 Sec. 3 ; CC-SPW-00900 T4, T7 ; Appendix 7/1	1	Were test certificates provided for PSV based on two consec separate P 12 months	
		2	If not, what	
		3	Were test c two consec the 12 mon	
		4	If not, what	
		5	Was an LA	
		6	Was an FI	
CE Marking - Constituents (Specific to SMA)	CC-SPW-00900 Cl. 1, CC-SPW-00900 Cl. 5, CC-SPW-00900 T7, CC-SPW-00900 T8, CC-GSW-00900 NG1.2a CC-PAV-04014	7	Was a Typ coarse agg	
		8	Was a Dec high PSV c	
		9	Was a CE coarse agg	
		10	Was a Typ fine aggreg	
		11	Was a Dec PSV55 fine	
		12	Was a CE PSV55 coa	
		13	Was a Dec filler in the	
CE Marking - Constituents (Specific to HRA)	CC-SPW-00900 Cl. 1, Cl. 4 CC-SPW-00900 T4 & T5 CC-GSW-00900 NG1.2a CC-PAV-04011	14	Was a Typ pre-coated	
		15	Was a Dec high PSV p	
		16	Was a CE PSV pre-co	
		17	Was a Dec filler in the	

Item	Specification Reference	#	Check (Y/N)	✓
CE Marking - Binder	CC-SPW-00900 Cl. 1 CC-GSW-00900 NG1.2a	18	Was a Type Test Report submitted for the binder used in the mixture?	
		19	Was a Declaration of Performance submitted for the binder used in the mixture?	
		20	Was a CE Marking certificate submitted for the binder used in the mixture?	
CE Marking - Product Composition	CC-SPW-00900 Cl. 1 CC-GSW-00900 NG1.2a	21	Was a Type Test Report submitted for the specified bituminous mixture?	
		22	Was a Declaration of Performance submitted for the specified bituminous mixture?	
		23	Was a CE Marking submitted for the specified bituminous mixture?	
Factory Production Control (FPC)	CC-SPW-00900 Cl. 1 CC-GSW-00900 NG1.2a	24	Was a copy of the Producer's Certificate of FPC submitted / obtained?	
		25	Was a copy of the Producer's NSAI Certificate for Quality Management System submitted / obtained?	
		26	Were Operating Compliance Level (OCL) reports for the Bituminous Mixture source(s) obtained?	
Works Proposals	CC-SPW-00900 Cl. 10.1.2	27	Were the Contractor's Works Proposals provided in advance of the Works?	
Monitoring of Construction - Laying/ Temperature Records	AM-PAV-06049 Cl. 7.2, CC-SPW-00900 Cl. 10.1.6 CC-SPW-00900 T3, T6, T9, T12 CC-PAV-04016	28	Were laying records provided to ensure traceability of material in the Works and assess compliance?	
		29	Were temperature records for the mixing plant provided?	
		30	Were discharge temperature records for the Works provided?	
		31	Were rolling temperature records for the Works provided?	
Works Requirements - Compaction Control and Performance Requirements	CC-SPW-00900 Cl. 10.1.9, CC-SPW-00900 Cl. 10.1.10, Appendix 7/1	32	Were cores extracted for assessment of voids content, stiffness and/or resistance to permanent deformation of material laid in the Works?	
		33	Or did the Contractor demonstrate by means of verifiable records that the proposed mixture was installed within specification for voids content and resistance to permanent deformation?	

Item	Specification Reference	#	Check (Y/N)	✓
Works Requirements - Test Results for the mixture laid in the Works	CC-SPW-00900 T5 & T8, Appendix 1/5	34	Were void content test results for the mixture laid in the Works provided?	
		35	Were resistance to permanent deformation test results for the mixture laid in the Works provided?	
		36	Were water sensitivity test results for the mixture laid in the Works provided?	
		37	Were stiffness test results for the mixture laid in the Works provided?	
		38	Were binder content and grading test results for the mixture laid in the Works provided?	
		39	For HRA, were binder content and grading test results for pre-coated chippings laid in the Works provided?	
		40	For HRA, were flakiness index test results for pre-coated chippings laid in the Works provided?	
	CC-SPW-00900 Cl. 10.1.11 CC-SPW-00900 T6 & T9	41	Was initial surface macrotexture after compaction and before opening to traffic measured using the volu	
		42	Wer ope	
Works Requirements - Macrotexture (Specific to HRA)	CC-SPW-00900 Cl. 10.1.11.1	43	For mac to a ach	
		44	For ass	
		45	For chip	
		46	For was carr	

Item	Specification Reference	#	Check (Y/N)	✓
Sampling, Storage and Retention of Samples	CC-PAV-04017 Appendix 1/5 or 1/6 CC-SPW-00100 Cl. 105.6	47	Were samples of the source aggregates (split or otherwise) used on the contract provided to the Employer's Representative?	
		48	If aggregate samples were provided, have these samples been retained?	
		49	Were samples of the pre-coated chippings (split or otherwise) used on the contract provided to the Employer's Representative?	
		50	If pre-coated chippings samples were provided, have these samples been retained?	
		51	Were samples of the bituminous mixture (split or otherwise) used on the contract provided to the Employer's Representative?	
		52	If mixture samples were provided, have these samples been retained?	

CC-PAV-04018

Outcomes of testing & research

Design Issues

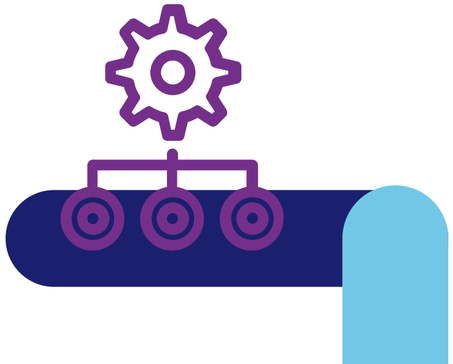
- Incorrect Site Category applied
- Underestimate of traffic at site
- Design requirements not translated into Works Requirements

Non-Conformance with Contract/Works Requirements

- ❖ Over embedment of precoated chippings in HRA leading to non-positive texture
- ❖ Macrotexture requirements in SMA materials not being achieved
- ❖ Poor site management leading to incorrect High PSV coarse aggregates used at required locations
- ❖ Some instances of contamination of high PSV aggregate stockpiles

Other

- ➢ Certain rock types struggling to perform in very high stressed locations, e.g. bends <250m radius
- ➢ These problematic rock/aggregate types tend to have overall negative microtexture or have positive asperities composed from fine-grained minerals
- ➢ Igneous & meta igneous rocks a particular concern!



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DN-PAV-03023

Surfacing Materials for New, Improvement and Maintenance Construction for Use in Ireland

DN-PAV-03023

Surfacing Materials for New, Improvement and Maintenance Construction for Use in Ireland

Key Changes/Updates:

- Change in title of document – inclusion of “Improvement”
  - Cl 1.2 - This Standard shall be used forthwith for all schemes for the construction, improvement and/or maintenance of National Roads projects…..
- Updates to Tables of Definitions & Abbreviations
- Table 2.1 - Updates on use of Asphalt Concrete surface courses
  - for use only in accommodation works
  - refer to DN-GEO-03047 for use on cycleways & greenway
- Cl 3.1 - Update to description of aggregate surface microtexture & how it is measured
  - Positive, neutral & negative microtexture
  - Rock type and source are important factors to consider in the durability of the surface course.

DN-PAV-03023

Surfacing Materials for New, Improvement and Maintenance Construction for Use in Ireland

Key Changes/Updates:

- Cl 3.1 & Note 4 to Table 3.1
  - ➢ Aggregates exhibiting an overall negative microtexture or that have positive asperities composed from fine-grained mineral aggregates (igneous and meta-igneous rocks) are not permitted for use on site categories S1 and S2 (Bend radius < 250m).
- Inclusion of new site category U0 for ‘Non-event urban carriageway with one-way traffic’
  - ➢ Same requirements to Site Category B – lower PSV requirements than U1 or U2

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								
U0	Non-event urban carriageway with one-way traffic	55	55	60	60	60	60	60*
U1	Urban 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+

DN-PAV-03023

Surfacing Materials for New, Improvement and Maintenance Construction for Use in Ireland

Key Changes/Updates:

- Previous section on performance and recipe specification removed
- Removal of requirement for registration of aggregate products for use in surfacing on TII central product register
  - Replaced with requirement for economic operators to retain information pertinent to the characterisation of aggregate products for use in surfacing as per Table 4.1
  - Provision of all required information further to a reasoned request from TII as Competent National Authority
  - Removal of associated annexes for registration of aggregate (previously Annexes C, D & E)

Characteristic	Test Description	Test	Test Method	Size for test	Test Frequency
Geometrical	Grading	Grading	I.S. EN 933-1	6/10; 10/14; 14/20 [1]	1 per week
	Fines content	Grading	I.S. EN 933-1	6/10; 10/14; 14/20 [1]	1 per week
	Particle shape	Flakiness Index	I.S. EN 933-3	6/10; 10/14; 14/20 [1]	1 per week
Physical	Resistance to fragmentation	Los Angeles Coefficient	I.S. EN 1097-2	10/14 [3]	1 per 6 months
	Particle density	Density	I.S. EN 1097-6	6/10; 10/14; 14/20 [1]	1 per 6 months
	Water absorption	Water Absorption	I.S. EN 1097-6	6/10; 10/14; 14/20 [1]	1 per 6 months
	Resistance to polishing (accelerated polishing machine on curved test specimens))	Polished Stone Value	I.S. EN 1097-8	6/10 [2] (passing 10mm retained 7.2mm flake sieve)[2]	2 suites per 12 month period
	Resistance to surface abrasion	Aggregate Abrasion Value	I.S. EN 1097-8	10/14 [3]	1 per 6 month period
	Resistance to polishing (Wehner/Schulze process on aggregate mosaics)	Friction After Polishing coefficient	I.S. EN 12697-49 & Annex A	6/10 [2] (passing 10mm retained 7.2mm flake sieve)[2]	1 per 12 month period
Durability	Resistance to weathering	Magnesium sulfate soundness	I.S. EN 1367-2	6/10	1 per 12 month period
Chemical & Geological Classification	Geological assessment of raw material (quarry deposit)	Identify and map lithologies and proportions	I.S. EN ISO 14689-1 & see 4.2.4.1	Quarry deposit	1 per 3 years & see 4.2.4.1
	Geological examination of the finished aggregate product	Identify lithologies and proportions	I.S. EN ISO 14689-1 & EN 932-3 & see 4.2.4.2	6/10 [2]	1 per 3 month period
	Petrographic assessment of the finished aggregate product	Thin sections	BS 812: Part 104 & ASTM C295 & see 4.2.4.3	6/10 [2]	See 4.2.4.3

DN-PAV-03023

Surfacing Materials for New, Improvement and Maintenance Construction for Use in Ireland

Applicability of DN-PAV-03023

- National Road Schemes other than PARR schemes and new construction may have interventions that impact on Site Category as defined in DN-PAV-03023 & AM-PAV-06045
- Schemes include Active Travel & Safety Schemes etc
- Where site category impacted, these schemes must comply with DN-PAV-03023
- Example – Provision of new pedestrian crossing in an urban location
  - ➢ New site category is U1
  - ➢ Higher PSV requirements
  - ➢ Pavement Intervention required
  - ➢ Factor into Budget/Costs

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

Speed Limit ≤ 60km/h								
U0	Non-event urban carriageway with one-way traffic	55	55	60	60	60	60	60*
U1	Urban 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+

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Future Updates, Trials & Ongoing Research

Future Updates, Trials & Ongoing Research

Ongoing Review of Standards

- PE-SMG-02002 – Traffic Assessment
- AM-PAV-06045 & AM-PAV-06046 – Skid Resistance Assessment & Management for National Roads
- AM-PAV-06060 – Pavement Asset Management Guide
- GE-PAV-01006 Use of Volume 7

Research

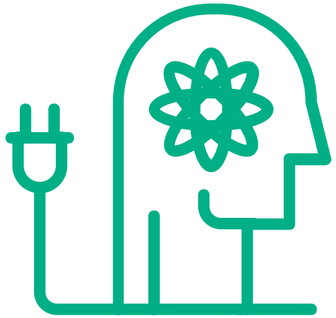
- ❖ Skid Resistance & Polishing - Friction After Polishing
- ❖ Aggregate testing – Use of Methylene Blue test for unbound aggregates
- ❖ Binder/Aggregate Interface – Impact on Asphalt Mixture Durability & Sustainability

Pilots & Trials

- ❑ Various Bio-binder Trials
- ❑ PMB in base & binder layers
- ❑ RA in surface courses

Collaboration with Industry

- ➢ Development of EPDs for bituminous materials ongoing
- ➢ Innovative Technologies & Pathway to Decarbonisation
- ➢ Ongoing Issues



Thank you

Questions?

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