TII Standards Roadshow – May 2024
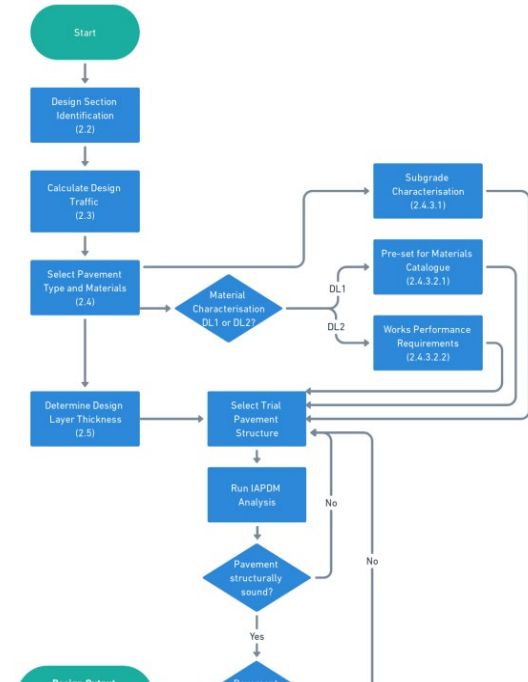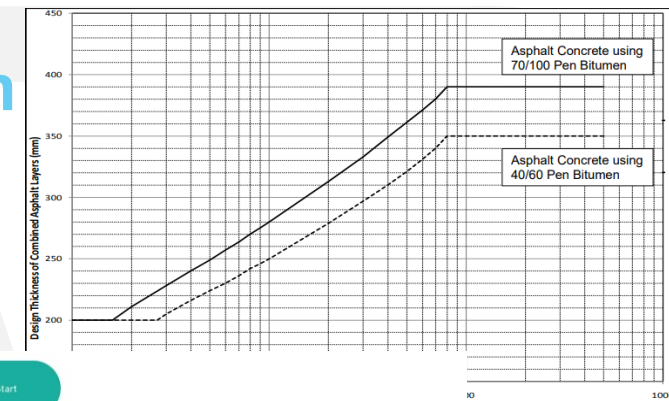
Irish Analytic Pavement Design Method (IAPDM)

Bonneagar Iompair Éireann
Transport Infrastructure Ireland

Edward Winterlich, 3rd May 2024

DN-PAV-03021 Analytical Pavement & Foundation Design & the Irish Analytic Pavement Design Method

- Updated DN-PAV-03021 published in August 2022
  - Previous Version (HD25-26/10) **WITHDRAWN**

- Design workflows provided for:
  - New pavement design
  - Existing pavement strengthening / overlay

- DN-PAV-03021 the IAPDM are mandatory for pavement design

- The IAPDM facilitates:
  - Web-based Mechanistic-Empirical pavement structural evaluation
  - Optimise pavement material use
  - Compare designs with innovative materials
  - Design levels:
    - Level 1 – Pre-set material categories with generalised performance characteristics
    - Level 2 – Material specification performance characterisation

- Request access iapdm@tii.ie

IAPDM Guide and Online Tutorials

- The correct implementation of DN-PAV-03021 is support by:
  - IAPDM Guide Document
  - Online Tutorials

- IAPDM Guide Document
  - Provides worked examples of common design problems and IAPDM implementation
  - Examples of new pavement design and existing pavement strengthening / overlay
  - Respond to common challenges experienced by users to date

- Online Tutorials
  - Realtime worked examples of common design problems and IAPDM implementation
  - Live tutor-delegate interaction to response to questions

Development of the IAPDM

- Mechanistic-Empirical Pavement Design

- United States, Netherlands, France, Austria

- Material performance characteristics

- Irish environmental and loading conditions

- Long term performance e.g. cracking, deformation
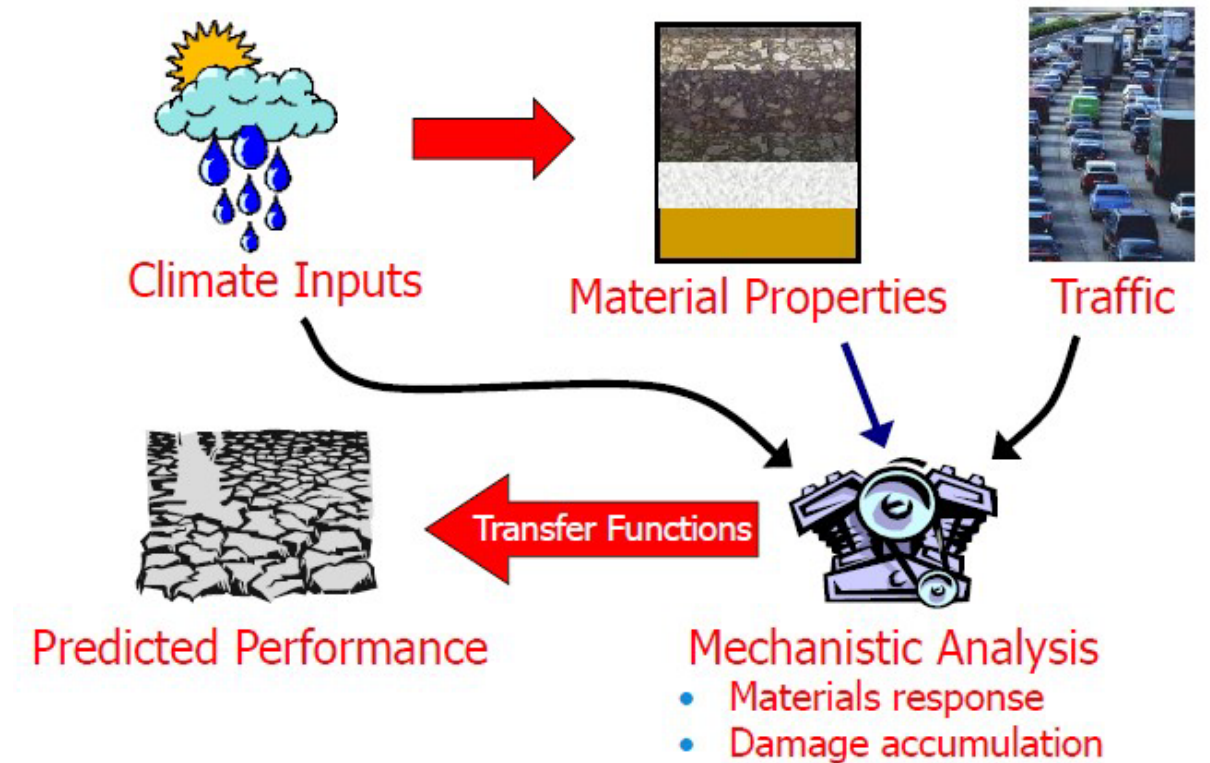
Material Design Levels – Modelling Pavement Performance

- Design levels allow for the optimisation of material use

Level 3 (future)

Lab. and QC performance testing **(advanced)**

Relaxed mixture and constituent requirements

Level 2

Lab and QC performance testing

Current mixture and constituent requirements

Level 1

Per mixture type

Current mixture and constituent requirements
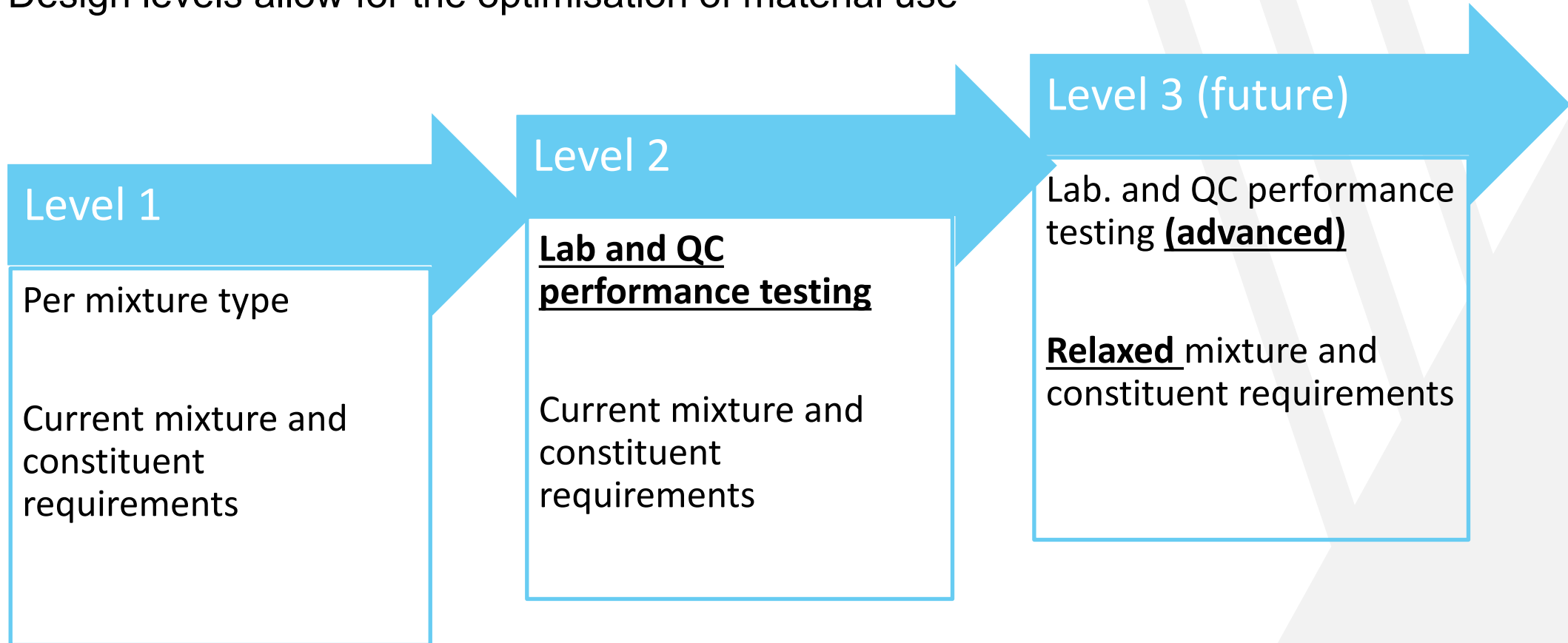
Material Design Levels

- Material Characterisation
  - Design Levels 1 and 2
  - Employer designed or DB/ECI/NEC

- Design Level 1
  - Pre-set material modelling parameters
  - Material constituent and mixture requirements

- Design Level 2
  - Specific material testing / characterisation
  - Material ranked /categorised
  - Influences modelling parameters
  - Pavement life / deterioration modelling

Table B1   **Bituminous Bound Material Works Performance Testing for Design Level 2**

C	Test Method[1]	Performance	Performance Category
Stiffness[1]	Indirect Tensile Stiffness Modulus (MPa) EN 12697-26:2018 Annex C IT-CY 20ºC	≥1800	S1
		≥2500	S2
		≥4500	S3
		≥6500	S4
Resistance to Fatigue	ε_6 (failure strain level at 1×10^6 load repetitions) EN 12697-24:2018 Annex E, IT-CY at 20ºC	<130	F1
		≥130	F2
		≥190	F3

Notes:

1. The above limits relate to the minimum of the average of the results from a set of test specimens.

2. Works testing frequencies to be agreed with TII Network Management on a project specific basis.

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IAPDM Web-based Software – Manage Projects and Designs

IAPDM Web-based Software – Materials Database

Add New Material

Model Level 1 ▾

TII Materials for Level 1

Show 10 ▾ entries   Search: [ ]

Name▾	Material Type⇕	Modulus (MPa)⇕	Poisson Ratio⇕	⇕
6F2 (CC-SPW-00600)	Unbound Granular Material	100	0.35	
AC20 40/60	Bituminous Bound Material	4700	0.35	
AC20 70/100	Bituminous Bound Material	3100	0.35	
AC32 40/60	Bituminous Bound Material	4700	0.35	
AC32 70/100	Bituminous Bound Material	3100	0.35	
HBM A C12/15 (CC-SPW-00800)	Hydraulically Bound Granular Material	40400	0.2	
HBM A C16/20 (CC-SPW-00800)	Hydraulically Bound Granular Material	44700	0.2	
HBM A C8/10 (CC-SPW-00800)	Hydraulically Bound Granular Material	34500	0.2	
HBM B C12/15 (CC-SPW-00800)	Hydraulically Bound Granular Material	38800	0.2	
HBM B C16/20 (CC-SPW-00800)	Hydraulically Bound Granular Material	42900	0.2	

Showing 1 to 10 of 18 entries   Previous 1 2 Next

IAPDM Web-based Software – Pavement Design Workflow

	Standard Axle Setup	Design Traffic (HD 24/06)	3 Pavement Structure

	Layer Type	Material	h (mm)	E (MPa)	v
Layer 1	Surface	HRA	50	2000.00	0.35
Layer 2	Binder	AC20 40/60	50	4700.00	0.35
Layer 3	Base 1	AC32 40/60	100	4700.00	0.35
Layer 4	Base 2	AC32 40/60	100	4700.00	0.35
Layer 5	Subbase	UGM A (CC-SPW-00800)	150	200.00	0.35
Layer 6	Capping	6F2 (CC-SPW-00600)	200	100.00	0.35
Layer 7	Subgrade	Subgrade	Semi-infinite	100.00	0.45

IAPDM Web-based Software – Design Analysis Results

Analysis Output

Layer No	Layer Type	Material	Thickness (mm)	Design Stiffness (MPa)	Poisson's Ratio	Critical Response Type	Critical Response Value	Structural Capacity (msa)	N/Nf	
1	Surface	HRA	40	2000	0.35	No tension	0	0.0	0.00	Success
2	Binder	AC20 40/60	60	4700	0.35	epsilon r (Microns)	-0	>100	0.00	Success
3	Base 1	AC32 40/60	100	4700	0.35	epsilon r (Microns)	-148	1.7	5.86	Fail
4	Unspecified	Not Considered	0	0	0.00	None	0	0.0	0.00	No Layer
5	Subbase	UGM A (CC-SPW-00800)	150	200	0.35	N/a	-	-	-	No Model
6	Capping	6F2 (CC-SPW-00600)	200	100	0.35	N/a	-	-	-	No Model
7	Subgrade	Subgrade	Semi-infinite	32	0.45	epsilon z (Microns)	395	1.7	5.84	Success/Fail - Hit

FC = 1

Surface Modulus = 83

END