AASHTOWare Pavement ME Design
Summary of Updates and Changes

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AASHTOWare Pavement ME Design (PMED)

Summary of Updates and Changes in Different Versions of the Software

Introduction

This document summarizes the updates and changes made to the Pavement ME Design software over time. The document is grouped into three parts, as listed below:

- The first part of the history document is a tabulation of the changes made to the software execution, changes in the global default layer/material properties, changes in the global calibration coefficients, and other modifications to compare selected versions over time.
- The second part of the history document lists the changes and updates made to the software on a chronological order basis.
- The third part of the history document lists the changes and modifications made by pavement design strategy and then in chronological order.

1 Part I – Tabulation of Software Changes by Release Version

Part I is a tabulation of the key or critical changes made to the software over time. This is not an inclusive listing of all changes made to the software (Table I.1), but those that impacted the calibration coefficients, software inputs, and/or operational features of the software.

[Note: The change in the cell color or highlighting across a row for a particular feature or items of the software indicates a change in the software between versions.]

Table I-1. Summary of Key Differences in Software Calibration Factors

Format, Transfer Functions, and Calibration Coefficients	MEPDG version 1.1	AASHTOWare Pavement ME Design version 2.3.1	AASHTOWare Pavement ME Design version 2.5.3	AASHTOWare Pavement ME Design version 2.6	AASHTOWare Pavement ME Design version 3.0
Application Type	Desk Top Version	Desk Top Version	Desk Top Version	Desk Top Version	Web-Application (Cloud) Version
Output Format	Excel-based	PDF- and Excel-based	PDF- and Excel-based	PDF- and Excel-based	PDF- and Excel-based
Climatic Input Data and Included in Output Summary	Data from Ground-Based Weather Stations; output summary NOT included.	Data from NARR database for rigid and flexible pavements; output summary included.	Data from NARR database for rigid pavements, and MERRA2 database for flexible and semi-rigid pavements; output summary included.	Data from NARR database for rigid pavements, and MERRA2 database for flexible and semi-rigid pavements; output summary included.	Data from MERRA2 database for all pavement design strategies; output summary included.
Axle Configuration Data in Output Summary	Excluded	Included	Included	Included	Included
Special Axle Load Configuration	Included	Excluded	Excluded	Included, but only for Asphalt and Semi-Rigid pavement design.	Included, but only for Asphalt and Semi-Rigid pavement design.
Recalibration of PCC Pavements because of issue with CTE Values in the LTPP Database	Original CTE values in LTPP database	Updated with revised CTE values in LTPP database	Updated with revised CTE values in LTPP database	Updated with revised CTE values in LTPP database	Updated with revised CTE values in LTPP database
Interface Friction between the PCC Slab and Underlying Layer	Constant to a specific age & then no interface friction.	Constant to a specific age & then no interface friction.	Constant to a specific age & then no interface friction.	Constant to a specific age & then no interface friction.	Added NCHRP 1-51; Interface friction varies through design life.

Format, Transfer Functions, and Calibration Coefficients		MEPDG version 1.1	AASHTOWare Pavement ME Design version 2.3.1	AASHTOWare Pavement ME Design version 2.5.3	AASHTOWare Pavement ME Design version 2.6	AASHTOWare Pavement ME Design version 3.0
Coefficient of Thermal Expansion (CTE) in MEPDG Manual of Practice		Default CTE for Basalt of 4.6	Default CTE for Basalt of 5.2	Default CTE for Basalt of 5.2	Default CTE for Basalt of 5.2	Default CTE for Basalt of 5.2
PCC Zero Stress Temperature in MEPDG Manual of Practice		PCC Zero Stress Temperature (Range 60° to 120° F)	PCC Set Temperature (Range 70° to 212° F)	PCC Set Temperature (Range 70° to 212° F)	PCC Set Temperature (Range 70° to 212° F)	PCC Set Temperature (Range 70° to 212° F)
Heat Capacity of Asphalt Pavement		Default value of 0.23 BTU/lb-°F	Default value of 0.28 BTU/lb-°F	Default value of 0.28 BTU/lb-°F	Default value of 0.28 BTU/lb-°F	Default value of 0.28 BTU/lb-°F
Thermal Conductivity of Asphalt Pavement		Default value of 0.67 BTU/(ft)(hr)(F)	Default value of 1.25 BTU/(ft)(hr)(F)	Default value of 1.25 BTU/(ft)(hr)(F)	Default value of 1.25 BTU/(ft)(hr)(F)	Default value of 1.25 BTU/(ft)(hr)(F)
Surface Shortwave Absorptivity		Default value of 0.95	Default value of 0.85	Default value of 0.85	Default value of 0.85	Default value of 0.85
Global Model Coefficient for Unbound Materials and Soils in Rutting Model; K1	Aggregate Base	ks_1 of 1.673	ks_1 of 2.03	ks_1 of 0.965	ks_1 of 0.965	ks_1 of 0.965
	Coarse-Grained Soil			ks_1 of 0.965	ks_1 of 0.965	ks_1 of 0.965
	Sand Soil			ks_1 of 0.635	ks_1 of 0.635	ks_1 of 0.635
	Fine-Grained Soil	k_{s1} of 1.35	k_{s1} of 1.35	ks_1 of 0.675	ks_1 of 0.675	ks_1 of 0.675
Global Calibration or Field-Adjustment Constant for Unbound Materials and Soils in Rutting Model; BS1	Aggregate Base	1.0	1.0	1.0	1.0	1.0
	Coarse-Grained Soil			1.0	1.0	1.0
	Sand Soil; A-3			1.0	1.0	1.0
	Fine-Grained Soil			1.0	1.0	1.0

Format, Transfer Functions, and Calibration Coefficients	MEPDG version 1.1	AASHTOWare Pavement ME Design version 2.3.1	AASHTOWare Pavement ME Design version 2.5.3	AASHTOWare Pavement ME Design version 2.6	AASHTOWare Pavement ME Design version 3.0
Multiple Asphalt Layer Rut Depth Characterization	Excluded	Included	Included	Included	Included
Global Laboratory Derived Model Coefficients in the Rut Depth Prediction Model	K_{1r} of -3.35412	k_{1r} of -3.35412	k_{1r} of -2.45	k_{1r} of -2.45	k_{1r} of -2.45
	k_{2r} of 1.5606	k_{2r} of 1.5606	k_{2r} of 3.01	k_{2r} of 3.01	k_{2r} of 3.01
	k_{3r} of 0.4791	k_{3r} of 0.4791	k_{3r} of 0.22	k_{3r} of 0.22	k_{3r} of 0.22
Global Local Calibration or Field-Adjustment Coefficients in the Rut Depth Prediction Model	B_{r1} of 1.0	β_{r1} of 1.0	β_{r1} of 0.40	β_{r1} of 0.40	β_{r1} of 0.40
	β_{r2} of 1.0	β_{r2} of 1.0	β_{r2} of 0.52	β_{r2} of 0.52	β_{r2} of 0.52
	β_{r3} of 1.0	β_{r3} of 1.0	β_{r3} of 1.36	β_{r3} of 1.36	β_{r3} of 1.36
Global Laboratory-Derived Model Coefficients in the Bottom-Up Fatigue Cracking Prediction Model in Flexible Pavement	k_{f1} of 0.007566 in./in.	k_{f1} of 0.007566 in./in.	k_{f1} of 3.75 mils/in.	k_{f1} of 3.75 mils/in.	k_{f1} of 3.75 mils/in.
	k_{f2} of -3.9492	k_{f2} of 3.9492	k_{f2} of 2.87	k_{f2} of 2.87	k_{f2} of 2.87
	k_{f3} of -1.281	k_{f3} of 1.281	k_{f3} of 1.46	k_{f3} of 1.46	k_{f3} of 1.46
Global Local Calibration or Field-Adjustment Constants for Bottom-Up Fatigue Cracking Prediction Model in Flexible Pavement	β_{1f} of 1.0	β_{1f} of 1.0	β_{1f} dependent on AC thickness, see note 1.	β_{1f} dependent on AC thickness, see note 1.	β_{1f} dependent on AC thickness, see note 1.
	β_{2f} of 1.0	β_{2f} of 1.0	β_{2f} of 1.38	β_{2f} of 1.38	β_{2f} of 1.38
	β_{3f} of 1.0	β_{3f} of 1.0	β_{3f} of 0.88	β_{3f} of 0.88	β_{3f} of 0.88
Global Bottom-Up Fatigue Cracking Transfer Function Coefficients	C1f of 1.0	C1f of 1.0	1.31	1.31	1.31
	C2f of 1.0	C2f of 1.0	C2f dependent of AC thickness, see note 2.	C2f dependent of AC thickness, see note 2.	C2f dependent of AC thickness, see note 2.
	C3f of 6,000	C3f of 6,000	C3f of 6,000	C3f of 6,000	C3f of 6,000

Format, Transfer Functions, and Calibration Coefficients	MEPDG version 1.1	AASHTOWare Pavement ME Design version 2.3.1	AASHTOWare Pavement ME Design version 2.5.3	AASHTOWare Pavement ME Design version 2.6	AASHTOWare Pavement ME Design version 3.0
Top-Down Fatigue Cracking Model and Transfer Function for Asphalt Wearing Surfaces	Based on repeated load fatigue but only considering longitudinal cracks.	Based on repeated load fatigue but only considering longitudinal cracks.	Based on repeated load fatigue but only considering longitudinal cracks.	Replaced existing model with NCHRP 1-52 product; top-down cracks include longitudinal & alligator cracks.	Replaced existing model with NCHRP 1-52 product; top-down cracks include longitudinal & alligator cracks.
Global Top-Down Fatigue Cracking Model Coefficients	k_{f1} of 0.007566 in./in.	k_{f1} of 0.007566 in./in.	k_{f1} of 3.75 mils/in.	KL1 of 64,271,618	KL1 of 64,271,618
	k_{f2} of -3.9492	k_{f2} of -3.9492	k_{f2} of 2.87	KL2 of 0.2855	KL2 of 0.2855
	k_{f3} of -1.281	k_{f3} of -1.281	k_{f3} of 1.46	KL3 of 0.011	KL3 of 0.011
				KL4 of 0.01488	KL4 of 0.01488
				KL5 of 3.266	KL5 of 3.266
Global Calibration or Field-Adjustment Constants for Top-Down Fatigue Cracking Prediction Model	β_{1f} of 1.0	β_{1f} of 1.0	β_{1f} of 1.0		
	β_{2f} of 1.0	β_{2f} of 1.0	β_{2f} of 1.0		
	β_{3f} of 1.0	β_{3f} of 1.0	β_{3f} of 1.0		
Global Top-Down Fatigue Cracking Transfer Function Coefficients	C1f of 7.00	C1f of 7.00	C1f of 7.00	C1 of 2.5219	C1 of 2.5219
	C2f of 3.50	C2f of 3.50	C2f of 3.50	C2 of 0.8069	C2 of 0.8069
	C3f of 1,000	C3f of 1,000	C3f of 1,000	C3 of 1.00	C3 of 1.00
Global Calibration or Field-Adjustment Coefficient in the Transverse Cracking Model for AC	k_t (Level 1) of 5.0	k_t (Level 1) of 1.5	k_s (Level 1) is MAAT dependent; see note 3.	k_s (Level 1) is MAAT dependent; see note 3.	k_s (Level 1) is MAAT dependent; see note 3.
	k_t (Level 2) of 1.5	k_t (Level 2) of 0.5	k_s (Level 2) is MAAT dependent; see note 3.	k_s (Level 2) is MAAT dependent; see note 3.	k_s (Level 2) is MAAT dependent; see note 3.
	k_t (Level 3) of 3.0	k_t (Level 3) of 1.5	k_s (Level 3) is MAAT dependent; see note 3.	k_s (Level 3) is MAAT dependent; see note 3.	k_s (Level 3) is MAAT dependent; see note 3.

Format, Transfer Functions, and Calibration Coefficients	MEPDG version 1.1	AASHTOWare Pavement ME Design version 2.3.1	AASHTOWare Pavement ME Design version 2.5.3	AASHTOWare Pavement ME Design version 2.6	AASHTOWare Pavement ME Design version 3.0
CTB Fatigue Cracking Model Coefficients for Semi-Rigid Pavements	K1 0f of 1.0	K1 0f of 1.0	K1 of 0.972	K1 of 0.972	K1 of 0.972
	K2 of 1.0	K2 of 1.0	K2 of 0.0825	K2 of 0.0825	K2 of 0.0825
	BC1of 1.0	BC1of 1.0	BC1 of 1.0	BC1 of 1.0	BC1 of 1.0
	BC2 of 1.0	BC2 of 1.0	BC2 of 1.0	BC2 of 1.0	BC2 of 1.0
Calibration Coefficients or Field Shift Factors for Fatigue Cracking of Semi-Rigid Pavements	C1 of 1.0	C1 of 1.0	C1 of 0.0	C1 of 0.0	C1 of 0.0
	C2 of 1.0	C2 of 1.0	C2 of 75	C2 of 75	C2 of 75
	C3 of 0.0	C3 of 0.0	C3 of 2.0	C3 of 2.0	C3 of 2.0
	C4 of 1,000	C4 of 1,000	C4 of 2.0	C4 of 2.0	C4 of 2.0
Calibration Coefficients in the JPCP Fatigue Cracking Prediction Model	C1 of 2.0	C1 of 2.0	C1 of 2.0	C1 of 2.0	C1 of 2.0
	C_2 of 1.22	C_2 of 1.22	C_2 of 1.22	C_2 of 1.22	C_2 of 1.22
	C_4 of 1.0	C_4 of 0.52	C_4 of 0.52	C_4 of 0.52	C_4 of 0.431
	C_5 of -1.98	C_5 of -2.17	C_5 of -2.17	C_5 of -2.17	C_5 of -2.303
Calibration Coefficients in the JPCP Faulting Prediction Model	C_1 of 1.29	C_1 of 1.0184	C_1 of 0.595	C_1 of 0.595	C_1 of 0.20
	C_2 of 1.1	C_2 of 0.91656	C_2 of 1.636	C_2 of 1.636	C_2 of 1.636
	C_3 of 0.001725	C_3 of 0.0021848	C_3 of 0.00217	C_3 of 0.00217	C_3 of 0.005
	C_4 of 0.0008	C_4 of 0.0008837	C_4 of 0.00444	C_4 of 0.00444	C_4 of 0.00444
	C_5 of 250	C_5 of 250	C_5 of 250	C_5 of 250	C_5 of 250
	C_6 of 0.4	C_6 of 0.47	C_6 of 0.47	C_6 of 0.47	C_6 of 0.20
	C_7 of 1.2	C_7 of 1.83312	C_7 of 7.3	C_7 of 7.3	C_7 of 20.0
	C_8 of 400	C_8 of 400	C_8 of 400	C_8 of 400	C_8 of 400

Format, Transfer Functions, and Calibration Coefficients		**MEPDG version 1.1**	**AASHTOWare Pavement ME Design version 2.3.1**	**AASHTOWare Pavement ME Design version 2.5.3**	**AASHTOWare Pavement ME Design version 2.6**	**AASHTOWare Pavement ME Design version 3.0**
Calibration Coefficient in the Rigid Pavement Punchout Prediction Model		C1 of 2.0	C1 of 2.0	C1 of 2.0	C1 of 2.0	C1 of 2.0
		C_2 of 1.22	C_2 of 1.22	C_2 of 1.22	C_2 of 1.22	C_2 of 1.22
		A_{PO} of 195.789	C_3 of 107.73	C_3 of 107.73	C_3 of 107.73	C_3 of 1760
		α_{PO} of 19.8947	C_4 of 2.476	C_4 of 2.475	C_4 of 2.475	C_4 of 49.7359
		β_{PO} of -0.526316	C_5 of -0.785	C_5 of -0.785	C_5 of -0.785	C_5 of -0.6009
SJPCP Overlay of Flexible Pavement Design Strategy		Excluded	Included	Included	Included	Included
Calibration Coefficients in the Short JPCP Overlay Longitudinal Cracking Prediction Model		Excluded	C_4 of 0.4	C_4 of 0.4	C_4 of 0.4	C_4 of 0.4
			C_5 of -2.21	C_5 of -2.21	C_5 of -2.21	C_5 of -2.21
Reflection Cracking Transfer Function		Empirical regression equation included	NCHRP 1-41 ME-based fracture mechanics model included	NCHRP 1-41 ME-based fracture mechanics model included	NCHRP 1-41 ME-based fracture mechanics model included	NCHRP 1-41 ME-based fracture mechanics model included
Reflection Cracks of Flexible, JPCP, CRCP, & Fractured Slabs	SIF, K1	Excluded	0.012	0.012	0.012	0.012
	SIF, K2	Excluded	0.005	0.005	0.005	0.005
	SIF, K3	Excluded	1.0	1.0	1.0	1.0

Format, Transfer Functions, and Calibration Coefficients		MEPDG version 1.1	AASHTOWare Pavement ME Design version 2.3.1	AASHTOWare Pavement ME Design version 2.5.3	AASHTOWare Pavement ME Design version 2.6	AASHTOWare Pavement ME Design version 3.0
Transverse Reflection Cracks of Flexible Pavements	Calibration Factor, C1	Regression equation.	3.22	3.22	3.22	3.22
	Calibration Factor, C2	Regression equation.	25.7	25.7	25.7	25.7
	Calibration Factor, C3	Regression equation.	0.10	0.10	0.10	0.10
	Calibration Factor, C4	Regression equation.	133.4	133.4	133.4	133.4
	Calibration Factor, C5	Regression equation.	-72.4	-72.4	-72.4	-72.4
Transverse Reflection Cracks of JPCP	Calibration Factor, C1	Regression equation.	0.1	0.1	0.1	0.1
	Calibration Factor, C2	Regression equation.	0.52	0.52	0.52	0.52
	Calibration Factor, C3	Regression equation.	3.1	3.1	3.1	3.1
	Calibration Factor, C4	Regression equation.	79.5	79.5	79.5	79.5
	Calibration Factor, C5	Regression equation.	-2.71	-2.71	-2.71	-2.71
Transverse Reflection Cracks of CRCP & Fractured Slabs	Calibration Factor, C1	Regression equation.	1.0375	1.0375	1.0375	1.0375
	Calibration Factor, C2	Regression equation.	1.8929	1.8929	1.8929	1.8929
	Calibration Factor, C3	Regression equation.	0.1	0.1	0.1	0.1
	Calibration Factor, C4	Regression equation.	262.1	262.1	262.1	262.1
	Calibration Factor, C5	Regression equation.	-9.6645	-9.6645	-9.6645	-9.6645
Fatigue Reflection Cracks of Flexible Pavements	Calibration Factor, C1	Regression equation.	0.38	0.38	0.38	0.38
	Calibration Factor, C2	Regression equation.	1.66	1.66	1.66	1.66
	Calibration Factor, C3	Regression equation.	2.72	2.72	2.72	2.72
	Calibration Factor, C4	Regression equation.	105.4	105.4	105.4	105.4
	Calibration Factor, C5	Regression equation.	-7.02	-7.02	-7.02	-7.02

Format, Transfer Functions, and Calibration Coefficients		MEPDG version 1.1	AASHTOWare Pavement ME Design version 2.3.1	AASHTOWare Pavement ME Design version 2.5.3	AASHTOWare Pavement ME Design version 2.6	AASHTOWare Pavement ME Design version 3.0
Reflection Cracks of Semi-Rigid Pavements	SIF, K1	Excluded	0.45	0.45	0.45	0.45
	SIF, K2	Excluded	0.05	0.05	0.05	0.05
	SIF, K3	Excluded	1.0	1.0	1.0	1.0
Transverse Reflection Cracks of Semi-Rigid Pavements	Calibration Factor, C1	Regression equation.	0.1	0.1	0.1	0.1
	Calibration Factor, C2	Regression equation.	0.9809	0.9809	0.9809	0.9809
	Calibration Factor, C3	Regression equation.	0.19	0.19	0.19	0.19
	Calibration Factor, C4	Regression equation.	165.3	165.3	165.3	165.3
	Calibration Factor, C5	Regression equation.	-5.1048	-5.1048	-5.1048	-5.1048
Fatigue Reflection Cracks of Semi-Rigid Pavements	Calibration Factor, C1	Regression equation.	1.64	1.64	1.64	1.64
	Calibration Factor, C2	Regression equation.	1.1	1.1	1.1	1.1
	Calibration Factor, C3	Regression equation.	0.19	0.19	0.19	0.19
	Calibration Factor, C4	Regression equation.	62.1	62.1	62.1	62.1
	Calibration Factor, C5	Regression equation.	-404.6	-404.6	-404.6	-404.6
IRI Regression Equation, Asphalt Pavements and Asphalt Overlays of Flexible Pavements	Rut Depth, C1	40.0	40.0	40.0	40.0	40.0
	Fatigue Cracking, C2	0.400	0.400	0.400	0.400	0.400
	Transverse Cracking, C3	0.0080	0.0080	0.0080	0.0080	0.0080
	Site Factor, C4	0.0150	0.0150	0.0150	0.0150	0.015

Format, Transfer Functions, and Calibration Coefficients		MEPDG version 1.1	AASHTOWare Pavement ME Design version 2.3.1	AASHTOWare Pavement ME Design version 2.5.3	AASHTOWare Pavement ME Design version 2.6	AASHTOWare Pavement ME Design version 3.0
IRI Regression Equation, Semi-Rigid Pavements, and Asphalt Overlays of Rigid Pavements	Rut Depth, PCC1	40.8	40.8	40.8	40.8	40.8
	Fatigue Cracking, PCC2	0.575	0.575	0.575	0.575	0.575
	Transverse Cracking, PCC3	0.0014	0.0014	0.0014	0.0014	0.0014
	Site Factor, PCC4	0.00825	0.00825	0.00825	0.00825	0.00825
IRI Regression Equation of JPCP	Cracking, C1	0.8203	0.8203	0.8203	0.8203	0.446
	Spalling, C2	0.4417	0.4417	0.4417	0.4417	0.373
	Faulting, C3	1.4929	1.4929	1.4929	1.4929	0.993
	Site Factor, C4	25.24	25.24	25.24	25.24	46.422
IRI Regression Equation of CRCP	Punchouts, C3	3.15	3.15	3.15	3.15	3.15
	Site Factor, C4	28.35	28.35	28.35	28.35	28.35

Note 1: β_{1f} for the adjustment to the laboratory-derived bending beam fatigue constant which is asphalt layer thickness dependent.

- Asphalt layer thickness less than 5 inches: β_{1f} equals 0.02054.
- Asphalt layer thickness equal to or greater than 5 inches but less than or equal to 12 inches: $\beta_{1f} = 5.014(h_{ac})^{-3.416}$
- Asphalt layer thickness greater than 12 inches: β_{1f} equals 0.001032.

Note 2: The adjustment to the calibration coefficient or field shift factor C_{2f} is asphalt layer thickness dependent.

- Asphalt layer thickness less than 5 inches: C_{2f} equals 2.1585.
- Asphalt layer thickness equal to or greater than 5 inches but less than or equal to 12 inches: $C_{2f} = 0.867 + 0.2583(h_{ac})$
- Asphalt Layer thickness greater than 12 inches: C_{2f} equals 3.9666

Note 3: The adjustment to the calibration coefficient or field shift factor for Kt is mean annual air temperature (MAAT) dependent.

- MAAT less than or equal to 57 ^{o}F (input levels 1, 2, and 3): $K_t = 3(10^{-7})(MAAT)^{4.0319}$
- MAAT greater than 57 ^{o}F (input levels 1, 2, and 3): $K_t = 0.13(MAAT)^2 - 11.68(MAT) + 244.14$

2 Part II – Chronological Changes to Software

The following summarizes the changes made to the software in chronological order since 2014.

2.1 *July 2023—v3.15, Web-Based Application*

- Multiple Overlays – In previous versions of the PMED software only one AC overlay of existing JPCP, CRCP, flexible, or semi-rigid pavements was allowed. The software now allows multiple AC overlays on these pavement types, up to a limit of four different AC layer types, including the existing AC pavement (if applicable).
- Creep Compliance for Input Level 2 - Input Level 1 dynamic modulus values can now automatically generate Level 2 creep compliance values through the transformation of the frequency-based measured dynamic modulus master curve to a time-based creep compliance master curve. This feature will save agencies the trouble of conducting lab testing for creep compliance.
- MAAT Below Freezing – In previous versions, the software produced an error message when the mean annual air temperature (MAAT) was below freezing (<32°F/0°C). The EICM has been modified so this error does not occur in extremely cold regions. The Canadian Technical Advisory Committee had requested this improvement.

2.2 July 2022—v3.0, Web-Based Application

The web-based application was first released in July 2022. Various updates were made to the software based on the guidance from the TRT. The following summarizes the enhancements made to the software in FY 2022, which were confined to the rigid pavement design models and transfer functions.

- Integration of the NCHRP 1-51 product on PCC slab – aggregate base friction degradation.
- Application and use of the MERRA2 climate dataset for designing rigid pavements. All pavement design strategies now use the MERRA2 climate dataset.

2.3 July 2022—PMED v2.6.2, Desk Top Application

No changes or updates were made to the desk top application v2.6.2 that was released in July 2022. The desk top application version does not include the enhancements made to the web-based application version 3.0.

2.4 July 2021—PMED v2.6.1

2.4.1 General Updates

- The absolute minimum or maximum input value limits were adjusted for the following inputs:
    - Dual tire spacing
        - The absolute minimum value was changed from 1 to a 0
    - Saturated hydraulic conductivity

        - Absolute maximum
            - SI – from 300 m/hr to 915 m/hr
            - US – from 1000 ft/hr to 3000 ft/hr
    - These values have no impact on the predicted distresses and only defines the min/max limits when the software should not run. Values outside of these ranges result in an error which will stop the software from running.
- Fixed an issue where the predicted JPCP cracking at the specified reliability would exceed 100 %. The value is capped at 100%.

2.4.2 Top-Down Cracking Module Update

- An error occurred in the AC over JPCP design strategy when an asphalt layer was included below the JPCP layer.
    - The layer converter module for TDC included the AC layer thickness below the JPCP layer when calculating the total asphalt thickness which resulted in an error when predicting the depth of top-down cracking.
    - The issue was fixed by only accounting for the AC layers above the JPCP layer.
    - This issue was not widely reported by users. A revision version was sent to any users with similar issues.
- Users have reported two convergence issues within the structural data converter module. The two items are identified below.
    - Dynamic modulus mastercurve conversion to relaxation modulus using Prony-series
        - It was found that the non-linear optimization fitting procedure did not use the correct gradient functions which resulted in higher sum of squared error (SSE) values in some cases.
        - The gradient functions were corrected which resulted in a consistently better fit for the mixes provided by users.
        - The issue was not widely observed for neat mixtures.
    - Power function fitting procedure to determine E1 and m.
        - The sum of squared error (SSE) convergence limit of 0.1 were too stringent. The value was adjusted to 0.2.
        - The non-linear optimization procedure to determine the E1 and m values was replaced with a linear regression function after performing a log transformation.
            - $E(t) = E_1(t)^m$

              $\log(E(t)) = \log(E_1) + m \times \log(t)$
        - The simplification of the fitting procedure from a non-linear optimization to a linear regression resulted in near identical E1 and m values.
    - The implemented changes did not show a difference in the final predicted top-down cracking for the set of verification and validation (v&v) test files. The v&v files are mostly based on neat mixtures and will be expanded to include a broader set of asphalt mixtures for future testing.

2.5 July 2020 —PMED v2.6

2.5.1 Manual of Practice Integration

The manual of practice or MOP is integrated with the Pavement ME Design software. Users can select "Help – MOP Help" in the menu ribbon and then select a property in the application and the application will open the integrated manual of practice PDF or addendum to the appropriate location.

2.5.2 General Updates

- EICM performance enhancements
- APADS performance enhancements
- Top Down Cracking Integration (Top-Down Cracking Enhancement (me-design.com))
- Climate map is updated for educational users to show all the climate station by default

2.6 July 2019 —PMED v2.5.5

2.6.1 Analysis Lift

The Pavement ME Design analysis subsystem has been completely reworked and can now run independently of the file system. Data transfer objects were created for each analysis module and are utilized during the analysis process.

2.6.2 General Updates

The climate user interface has been updated to use the Google Maps API.

2.7 April 2019 —PMED v2.5.4

2.7.1 General Updates

- Installer has "silent" install mode.
- Error corrected from the transliteration work in the FilterOutput module. The error affected only projects using the special traffic module, causing it to under predict rutting. Rutting predictions in this version match expected values.

2.7.2 Climate Updates

- Updated climate UI (Using Google Maps)
    - Uses Google Places API for finding map locations
    - Properly stores project location and elevation
    - Added zoom in/out features to climate map
    - Added project location and climate data selection distinction to the map
    - Ported previous functionality related to showing climate data points, selecting climate data, and data point interpolation for virtual climate stations based on elevation to the new map
    - Ported the Map service provider to the Pavement ME Design customer website
- Seasonal moduli was causing APADS to crash for some projects. This has been fixed and user input seasonal moduli no longer cause a crash.
- Truncation issue in MonthlyClimateSummary output writer was resolved. This issue was causing some analyses not to run. They now run correctly.

2.8 October 2018 —PMED v2.5.3

2.8.1 Database Fixes

- Changed the IDT property browsable field logic to handle project null reference for the first-most asphalt layer when selecting layer data from a database
- Application no longer encounters errors when selecting flexible layers from the database
- Layer selection and library material data now match display names correctly. Both now also are assigned the correct property grid data.

- Error related to binder properties was not properly dismissed after user correction. The error is now correctly dismissed after correction by the user.
- Layer material names were not being displayed correctly in the database material view. This has been corrected.
- Removed database update logic from the source code out to a more appropriate update script.

2.8.2 Analysis

- Corrected an error in the faulting module affecting bonded overlays that only allowed design periods of 20 years or less. Bonded overlay designs can again run up to 100 years.
- Corrected an error message for steel depth in the SI version. The validation check now properly converts to SI units.

2.8.3 Sensitivity

- No longer crashes when inputting data into the sensitivity data grid.

2.8.4 General Updates

- Local calibration factors no longer reset to the global defaults upon opening the application.
    - Note that if users had altered the global calibration files, the program was defaulting back to their modified global calibration coefficients.
- Crack spacing prediction model in CRCP designs is now properly utilized according to user selection.
- Traffic axle load now use the appropriate event for processing updates to the grid. This has improved load time.

2.9 August 2018 —PMED v2.5.2

2.9.1 General Updates

- AC Rehabilitation Design Changes
    - Default level has been changed to level 2.
    - The allowable range for the existing layer fatigue cracking amount (%) has been changed from 1-80 percent to 0-80 percent.
- The Help Manual has been updated to reflect the climate UI changes.
- Application Defaults Changes:
    - Users can once again define defaults so that they show up for selection in the appropriate selection dialogs. User defined default files should be stored at C:\ProgramData\AASHTOWare\ME Design\User Defaults. The application will check here first to see if the user has supplied defaults and will use any defaults found in this location when creating new projects.
    - A new node has been added to the "Tools" node in the explorer tree. "Export Configurable Templates" will output the default files that come with the installer. (note these are not user defined defaults). These can then be altered and used as

    agency/machine specific defaults by placing them in the C:\ProgramData\AASHTOWare\ME Design\User Defaults folder.
  - Calibration coefficient defaults were also moved to the C:\ProgramData\AASHTOWare\ME Design\User Defaults\Calibration folder.
- Water table depth was not accepting the user defined values and would continuously revert back to previously entered value for the project. This has been corrected.
- Updated API key for Google Maps elevation API per changes to Google Maps API policies.
- Several minor bugs fixes.
- Fixed error related to incorrect index selection when retrieving material layer data from the database.
- Asphalt fatigue damage beta f1 updated as follows:
  - v2.5.0; v2.5.1
    - Less than 5 inches: β_f1=0.002054
    - 5 to 14 inches: β_f1=0.5014(h_AC)^(-3.416)
    - Greater than 14 inches: β_f1=0.00061
  - v2.5.2
    - Less than 5 inches: β_f1=0.02054
    - 5 to 12 inches: β_f1=5.014(h_AC)^(-3.416)
    - Greater than 12 inches: β_f1=0.001032
- Bottom-up fatigue cracking C2 calibration coefficient updated as follows:
  - v2.5.0; v2.5.1
    - Less than 5 inches: 2.1585
    - 5 inches to 14 inches: 0.867 + 0.2583 * hac
    - Greater than 14 inches: 4.5
  - v2.5.2
    - Less than 5 inches: 2.1585
    - 5 inches to 12 inches: 0.867 + 0.2583 * hac
    - Greater than 12 inches: 3.9666

2.10 July 2018 —PMED v2.5.0

2.10.1 Manual of Integration

The manual of practice or MoP is now integrated with the Pavement ME Design software. Users can now select “Help – MOP Help” in the menu ribbon and then select a property in the application and the application will open the integrated manual of practice PDF or addendum to the appropriate location.

2.10.2 Modulus API

The modulus API was developed for researchers wanting to work directly with the modulus analysis module in Pavement ME Design. The API allows users to programmatically access modulus data including master curve coefficients, A-VTS, and standard error reports.

2.10.3 MasterTCModel File API

The MasterTCModel File API provides researchers with programmatic access to the thermal cracking outputs in Pavement ME Design. It completely defines the input and output intermediate files and provides programmatic access to those files.

2.10.4 Report Customization

Users may now customize their output report based on performance criteria. The performance criteria user interface has been improved to include checkboxes next to each performance criteria. Checking or unchecking these boxes will appropriately display or hide these outputs in the PDF and Excel reports.

2.10.5 Enhanced Project Comparison

Significant improvements have been made to the comparison tool in the Pavement ME Design user interface. Users can now enter a "filter" mode when comparing projects and select which properties they want to compare between two projects. The user's filter selections are automatically saved and used by the application for future comparisons. More user-friendly metadata is now available in the comparison tool window.

2.10.6 Maintenance Strategy Tool

Users now have access to a single shot maintenance strategy which affects the projects performance parameters during an analysis run for specific surface treatments for rigid and flexible pavements. Only "non-structural" maintenance strategies are currently available. The results of applying the maintenance strategy are included in the PDF and Excel output reports.

2.10.7 Integration of MERRA Climate Data for Flexible Pavements

Flexible designs have now been calibrated to use the MERRA-2 data set. Users can download climatic HCD files from the InfoPave site https://infopave.fhwa.dot.gov/Tools/MEPDGInputsFromMERRA or by selecting a project location from a map based input in the updated climate tab. The application will not allow rigid designs to be run with the MERRA data set as they have not yet been calibrated for that climate data. For more information on the available climatic data sets and their application in Pavement ME Design, please see the climatic addendum at http://me-design.com/MEDesign/Download.aspx under the "Addendums to the Manual of Practice" tab.

2.10.8 Transliteration of Analysis Executables to C#

All FORTRAN and C++ code in the analysis engine has been converted to C#. Major step toward creating a viable web application.

2.10.9 Tensile Strength for Level 1 Inputs

Input level 1 is now available in the user interface for entering tensile strength data. Level 1 inputs are used to predict the change in tensile strength over different temperatures. The Molinaar default relationship between tensile strength and temperature have been added to the software. Users may now enter different tensile strengths with different temperatures.

2.10.10 Recalibration

New flexible and flexible rehab pavement designs (including semi-rigid) have undergone recalibration as a result of the technical audit changes and the new MERRA-2 climate data set.

2.10.11 General Updates

- APADS now runs 100-year designs. The analysis should now correctly run 100-year designs.

2.11 July 2016 —PMED v2.3.0

2.11.1 Inclusion of ("Short") SJPCP/AC Analysis Model

The ARA team in FY 2016 evaluated the feasibility of implementing the Bonded Concrete Overlay of Asphalt Pavement Mechanistic-Empirical (BCOA-ME) model in the AASHTOWare Pavement ME Design software to improve the software's ability to predict bonded concrete overlay distresses. The BCOA-ME model was developed at the University of Pittsburgh as part of the Federal Highway Administration (FHWA) Transportation Pooled Fund Study TPF-5(165), Development of Design Guide for Thin and Ultrathin Concrete Overlays of Existing Asphalt Pavements.

2.11.2 Climate Database Update

Starting with version 2.3.0 of AASHTOWare Pavement ME Design, the generated climate data files will be based on the NARR dataset model. The NARR project is an extension of the NCEP Global Reanalysis which is run over the North American Region. The NARR model uses the very high resolution NCEP Eta Model (32km/45 layer) together with the Regional Data Assimilation System (RDAS) which, significantly, assimilates precipitation along with other variables. The improvements in the model/assimilation have resulted in a dataset with substantial improvements in the accuracy of temperature, winds and precipitation compared to the NCEP-DOE Global Reanalysis 2. NARR output data includes 8 times daily data at 29 levels and all weather variables required by ME Design. **Note that the NARR HCD files will be available for download on July 15th, 2016 from the ME Design website.**

2.11.3 Map-ME

Starting on July 15th, Users can visit www.me-design.com/MapME to utilize the new SJPCP/AC analysis along with an updated climate data set from the NARR. MapME pulls data from several government data sets to provide inputs for design projects. Users can then use this data to generate a fully functional ME Design project file for use in the software.

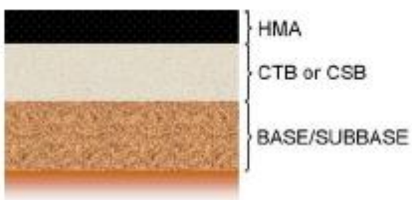
2.12 August 2015 —PMED v2.2

2.12.1 Inclusion of NCHRP 1-41 Reflection Cracking Model

The software has successfully integrated with the NCHRP 1-41 reflection cracking model. These alterations bring big changes to existing designs and are heavily detailed and described in the help document.

The following additional design types are included in this release:

- New Semi-Rigid Pavement: A semi-rigid pavement is composed of a flexible layer (e.g., HMA) and a rigid layer (e.g., cement-treated base [CTB], cement stabilized base [CSB], rolled-compacted concrete [RCC], or lean mix concrete).
- AC Overlay of Existing Semi-Rigid Pavement: This is the placement of an AC overlay over an existing semi-rigid pavement.



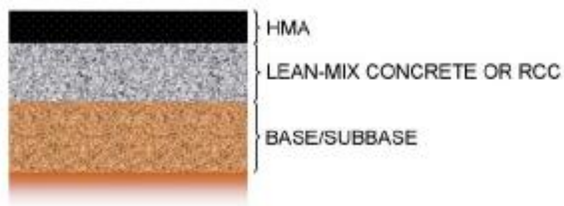


Figure showing typical structures for new semi-rigid pavements

This release also includes enhanced capabilities for the following design types:

- AC Overlay of Existing AC Pavements.
- AC Overlay of Existing Intact JPCP.
- AC Overlay of Existing Intact CRCP.
- AC Overlay of Fractured JPCP.
- AC Overlay of Fractured CRCP.

Detailed information on the additional design types and enhanced design capabilities (new inputs, performance criteria, new prediction models and algorithms, model calibration coefficients, and reliability) are presented in the AASHTOWare Pavement ME Design Software Help System.

2.12.2 DRIP Software Posting

The DRIP software has been added to the Pavement ME Design website as a part of the Pavement ME Design suite of tools.

2.12.3 LTPP Traffic Level 1 WIM Sites Data

New LTPP traffic data is now available in Pavement ME Design via the Traffic node in the user interface. Right clicking on the traffic node will now allow users to import the new traffic data and allows users to update their axle load configuration nodes.

2.12.4 Level 1 and Level 2 Inputs for PCC Overlays of Existing AC Pavements

The software now allows users to include Level 1 and 2 inputs for this design type and perform preliminary evaluation of the designs performed using these inputs. See the Help manual for further information.

2.12.5 Inclusion of New PCC Pavement Model Calibration Coefficients

The software is now fully integrated with the results from NCHRP Project 20-24 (Task 388).

2.12.6 Map-ME

Starting on September 1st, Users can visit www.me-design.com/MapME to get "Level 4" data associated with their projects. MapME pulls data from several government data sets to provide inputs for design projects. Users can then use this data to generate a fully functional ME Design project file for use in the software.

2.12.7 APIs for JULEA and the ICM

API integration work has been completed and the software now comes with complete API integration for the ICM and JULEA analyses. Documentation regarding the file formats is now available on the ME Design website and a separate set of dynamic link libraries (dll's) specific to the API integration work are available for download and use in custom development projects.

2.13 July 2014 —PMED v2.1.22

2.13.1 Backcalculation Summary Reports

ME Design now supports summary reports for backcalculation data and allows users to utilize backcalculation with thickness optimization on each station project. The backcalculation summary report (without thickness optimization) shows the specific distress data per station, the average, standard deviation, and percent passing for each distress type in a unique chart.

Users now also have the option of running backcalculation projects with thickness optimization enabled. These runs can also be used to generate a separate summary report which shows the recommended overlay thickness for each station, the mean thickness across stations, and the standard deviation of the pavement thickness.

2.13.2 Automatic Updater

New in release 2.1.22 is the automatic updater (AU). The AU is a new UI in ME Design which gives the user the option to automatically check for available system updates. Users are presented options for the AU as follows:

1) Download/Install updates automatically – User will not be prompted when updates occur and download, and installation of updates will occur silently (user will be prompted for administrative privileges if required).
2) Download updates but let me choose whether to install them – The updater always downloads the updates but does not install the updates until the user gives the OK.

3) Check for updates but let me choose whether to download and install them – User is notified that updates are available, but no download or updates occur without the user actively requesting them. **(This is the default option).**
4) Never check for updates – Updates are not checked or applied.

The UI will remember the user's choice (on a per user basis) and when appropriate, will contact the ME Design web service to download and install updates. Installation is done "hot" as well but requires a restart of the program to apply changes.

2.13.3 Inclusion of Subgrade Modulus in Sensitivity Analysis

Users can now enter the subgrade moduli in the sensitivity analysis and run sensitivity for the selected layers.

2.13.4 Enhanced help documentation

HTML Help is now context sensitive for most modules in the software. Users can now click on a row in a property grid and be directed to the appropriate place in the help document.

2.14 January 2014 —PMED v2.0.19

2.14.1 Citrix and Remote Desktop Services Support

Client virtualization features for Citrix and Remote Desktop Services have been added. Citrix and RDS are now fully supported by the software. There are a couple of special setup steps to follow after installation of the software on the Citrix machine.

Special Citrix Setup Requirements

First, you will want to create a group or role to which you can add your ME Design user accounts. This role will need read/write access to the directories where ME Design users will be saving their pavement design projects (.dgpx files).

After creating the group/role account, add your ME Design users to the new group. Open the "Local Services" on your Citrix machine and find the "ExecutionManagerWindowsService" or EMWS. Right click it and select "Properties", then click on the "Security" tab.

From here, you can select your group/role account for the service. All user accounts utilizing the ME Design application (and the EMWS) will now have read/write access to their appropriate network directories.

*****Note that without these steps, users will not be able to run ME Design analyses*****

2.14.2 Layer by Layer Asphalt Rutting

The layer by layer asphalt rutting coefficients are now available for analysis purposes. The application defaults to using the project single asphalt layer rutting calibration coefficients as the default value for the multi-layer rutting coefficients. Please see the help manual for a more detailed explanation of layer by layer rutting changes.

2.14.3 Traffic Inputs for SI Bins

The US Customary bins have been converted for rounded SI metric bins. In previous versions, the SI bin was a 1:1 conversion from US Customary to SI (i.e. 3000 lbs = 1361 kg). The current version uses SI metric bins rounded to the nearest 500 or 1000 kg. Existing ME Design project files are converted during load to apply these new limits.

2.14.4 Special Traffic Load

Users can now input special axle traffic information by selecting a special traffic checkbox on the main project tab. Please see the help manual for a detailed explanation. Note that this enhancement affects only asphalt (non-PCC) analysis types.

2.14.5 Database updates and enhancements

The database was improved to be more stable and to provide enhanced selection and insert functionality. These include the following changes:

- Multiple object delete now available.
- Resizable selection and insert dialogs
- Automatic database updater (database will update to newest version without file/data loss). **User will need ALTER TABLE rights to use new version.**

2.14.6 Enhanced help documentation

Updated the help documentation to reflect software changes. Added server based and local HTML help in addition to existing PDF help document.

2.14.7 File Converter

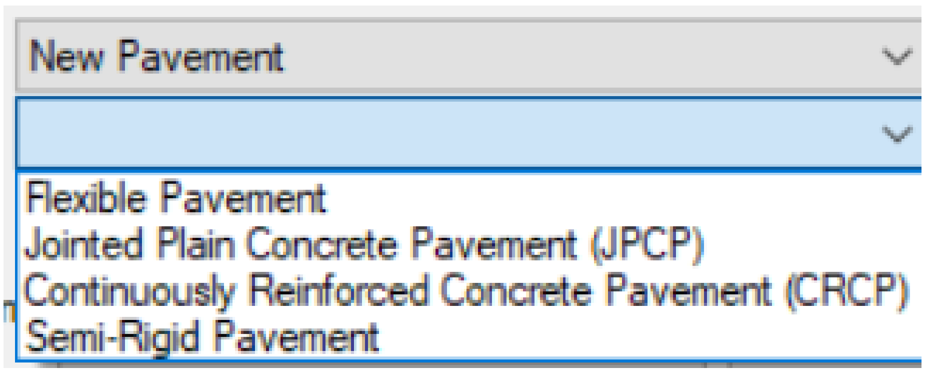
Version 1.x files will need to be converted to the new 2.0 format before they can be run. This is done automatically in ME Design when opening the file. The user will be prompted to convert the file to version 2.0.

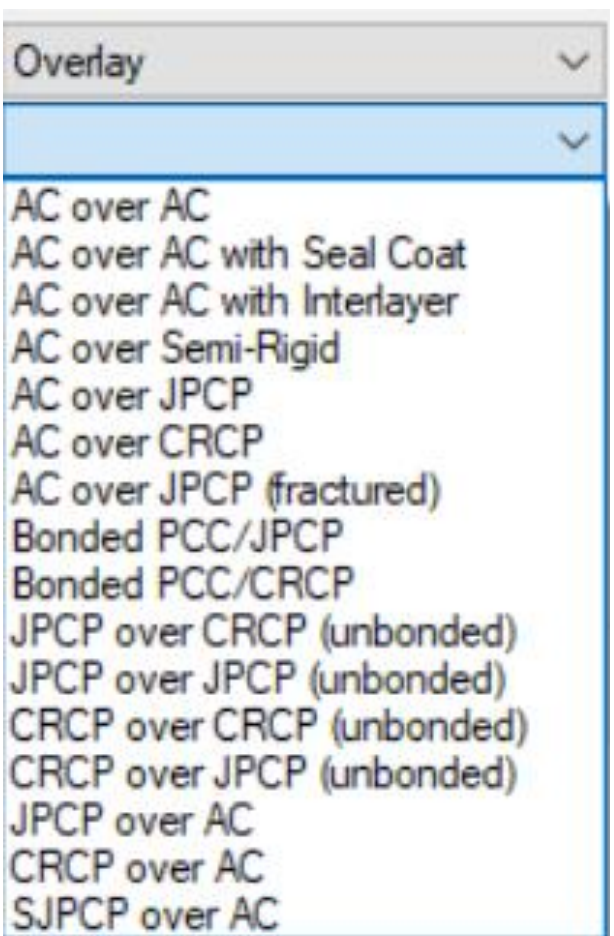
Once converted, the file will no longer be usable in version 1.x**

*****Files cannot be converted in batch mode. Up to ten files can be converted at a time using the user interface*****

3 Part III – Changes to Software Organized by Pavement Design Strategy

The following summarizes the changes made to the software by design strategy and in chronological order that had an impact on the predicted distresses, and thus, the calibration coefficients. The design strategies are organized by the design strategies included in the software as displayed below.





3.1 Flexible/Asphalt Pavement Design

The following summarizes the changes made to the software for the flexible or asphalt pavement design strategy in chronological order since 2014.

3.1.1 July 2023—PMED v3.15, Web-Based Application

Input Level 1 dynamic modulus values can now automatically generate Level 2 creep compliance values through the transformation of the frequency-based measured dynamic modulus master curve to a time-based creep compliance master curve.

3.1.2 July 2022—PMED v3.0, Web-Based Application

The flexible pavement web-based application was released in July 2022. Various updates were made to the software based on the guidance from the TRT. The predicted distresses for the asphalt pavement design strategy are the same as for v2.6.6; no changes were made to the software that had an impact on the calculated flexible pavement distresses.

3.1.3 July 2020—PMED v2.6, Manual of Practice Integration

The manual of practice or MOP is integrated with the Pavement ME Design software. Users can select "Help – MOP Help" in the menu ribbon and then select a property in the application and the application will open the integrated manual of practice PDF or addendum to the appropriate location.

3.1.4 July 2020—PMED v2.6, Inclusion of Top-Down Fatigue Cracking

The NCHRP 1-42 fracture-based product for top-down cracking in the asphalt wearing surface was integrated into the PMED software. The existing repeated load bending fatigue cracking prediction model and transfer functions were replaced with a fracture mechanics-based top-down fatigue cracking model and transfer functions.

The other change included in this version related to top-down cracking was the outcome from the PMED software for top-down cracking. The predicted variable is percent cracking of the total lane area. Top-down fatigue cracks can be a combination of longitudinal and alligator cracks. In earlier versions of the software the outcome variable was length of longitudinal cracks in the wheel path.

3.1.5 July 2018—PMED v2.5.0, Manual of Integration

The manual of practice or MoP is now integrated with the Pavement ME Design software. Users can now select "Help – MOP Help" in the menu ribbon and then select a property in the application and the application will open the integrated manual of practice PDF or addendum to the appropriate location.

3.1.6 July 2018—PMED v2.5.0, Maintenance Strategy Tool Enhancement

Users now have access to a single shot maintenance strategy which affects the projects performance parameters during an analysis run for specific surface treatments for rigid and flexible pavements. Only "non-structural" maintenance strategies are currently available. The results of applying the maintenance strategy are included in the PDF and Excel output reports.

3.1.7 July 2018—PMED v2.5.0, Recalibration

New flexible and flexible rehab pavement designs (including semi-rigid) have undergone recalibration, as a result of the technical audit changes and the new MERRA-2 climate data set for asphalt surfaced pavements.

3.1.8 July 2018—PMED v2.5.0, Integration of MERRA Climate Data for Flexible Pavements

Flexible designs have now been calibrated to use the MERRA-2 data set. Users can download climatic HCD files from the InfoPave site https://infopave.fhwa.dot.gov/Tools/MEPDGInputsFromMERRA or by selecting a project location from a map based input in the updated climate tab. The application will not allow rigid designs to be run with the MERRA data set as they have not yet been calibrated for that climate data. For more information on the available climatic data sets and their application in Pavement ME Design, please see the climatic addendum at http://me-design.com/MEDesign/Download.aspx under the "Addendums to the Manual of Practice" tab.

3.1.9 July 2018—PMED v2.5.0, Tensile Strength for Level 1 Inputs

Input level 1 is now available in the user interface for entering tensile strength data. Level 1 inputs are used to predict the change in tensile strength over different temperatures. The Molinaar default relationship between tensile strength and temperature have been added to the software. Users may now enter different tensile strengths with different temperatures.

3.1.10 July 2016—PMED v2.3.0, Climate Database Update, NARR

Starting with version 2.3.0 of AASHTOWare Pavement ME Design, the generated climate data files will be based on the NARR dataset model for flexible and rigid pavements. The NARR project is an extension of the NCEP Global Reanalysis which is run over the North American Region. The NARR model uses the very high resolution NCEP Eta Model (32km/45 layer) together with the Regional Data Assimilation System (RDAS) which, significantly, assimilates precipitation along with other variables. The improvements in the model/assimilation have resulted in a dataset with substantial improvements in the accuracy of temperature, winds and precipitation compared to the NCEP-DOE Global Reanalysis 2. NARR output data includes 8 times daily data at 29 levels and all weather variables required by ME Design.

3.1.11 July 2014—PMED v 2.1.22, Inclusion of Subgrade Modulus in Sensitivity Analysis

Users can now enter the subgrade moduli in the sensitivity analysis and run sensitivity for the selected layers.

3.1.12 July 2014—PMED V2.1.22, Enhanced help documentation

HTML Help is now context sensitive for most modules in the software. Users can now click on a row in a property grid and be directed to the appropriate place in the help document.

3.1.13 January 2014—PMED v2.0.19, Layer by Layer Asphalt Rutting

The layer-by-layer asphalt rutting coefficients are now available for analysis purposes. The application defaults to using the project single asphalt layer rutting calibration coefficients as the default value for the multi-layer rutting coefficients. Please see the help manual for a more detailed explanation of layer-by-layer rutting changes.

3.2 JPCP Design

The following summarizes the changes made to the software for the flexible or asphalt pavement design strategy in chronological order since 2014.

3.2.1 July 2022—PMED v3.0, Web-Based Application

The JPCP web-based application was released in July 2022. Various updates were made to the software based on the guidance from the TRT. The following summarizes the enhancements made to the software in FY 2022, which were confined to the rigid pavement design models and transfer functions.

- Integration of the NCHRP 1-51 product on PCC slab – aggregate base friction degradation.
- Application and use of the MERRA2 climate dataset for designing rigid pavements. All pavement design strategies now use the MERRA2 climate dataset.

The MERRA2 climate dataset and the integration of the NCHRP 1-51 product did have an impact on the JPCP predicted distresses, so the JPCP calibration coefficients were revised.

3.2.2 July 2020—PMED v2.6, Manual of Practice Integration

The manual of practice or MOP is integrated with the Pavement ME Design software. Users can select "Help – MOP Help" in the menu ribbon and then select a property in the application and the application will open the integrated manual of practice PDF or addendum to the appropriate location.

3.2.3 July 2018—PMED v2.5.0, Manual of Integration

The manual of practice or MoP is now integrated with the Pavement ME Design software. Users can now select "Help – MOP Help" in the menu ribbon and then select a property in the application and the application will open the integrated manual of practice PDF or addendum to the appropriate location.

3.2.4 July 2018—PMED v2.5.0, Maintenance Strategy Tool Enhancement

Users now have access to a single shot maintenance strategy which affects the projects performance parameters during an analysis run for specific surface treatments for rigid and flexible pavements. Only "non-structural" maintenance strategies are currently available. The results of applying the maintenance strategy are included in the PDF and Excel output reports.

3.2.5 July 2016—PMED v2.3.0, Climate Database Update, NARR

Starting with version 2.3.0 of AASHTOWare Pavement ME Design, the generated climate data files will be based on the NARR dataset model for flexible and rigid pavements. The NARR project is an extension of the NCEP Global Reanalysis which is run over the North American Region. The NARR model uses the very high resolution NCEP Eta Model (32km/45 layer) together with the Regional Data Assimilation System (RDAS) which, significantly, assimilates precipitation along with other variables. The improvements in the model/assimilation have resulted in a dataset with substantial improvements in the accuracy of temperature, winds and precipitation compared to the NCEP-DOE Global Reanalysis 2. NARR output data includes 8 times daily data at 29 levels and all weather variables required by ME Design.

3.2.6 August 2015—PMED v2.2, Inclusion of New PCC Pavement Model Calibration Coefficients

The software is now fully integrated with the revised calibration coefficients from NCHRP Project 20-24 (Task 388).

3.2.7 July 2014—PMED V2.1.22, Enhanced help documentation

HTML Help is now context sensitive for most modules in the software. Users can now click on a row in a property grid and be directed to the appropriate place in the help document.

3.3 CRCP Design

The following summarizes the changes made to the software for the flexible or asphalt pavement design strategy in chronological order since 2014.

3.3.1 July 2022—PMED v3.0, Web-Based Application

The CRCP web-based application was released in July 2022. Various updates were made to the software based on the guidance from the TRT. The following summarizes the enhancements made to the software in FY 2022, which were confined to the JPCP design models and transfer functions.

- Integration of the NCHRP 1-51 product on PCC slab – aggregate base friction degradation.
- Application and use of the MERRA2 climate dataset for designing rigid pavements. All pavement design strategies now use the MERRA2 climate dataset.

The MERRA2 climate dataset and the integration of the NCHRP 1-51 product did have an impact on the JCRP predicted distresses, so the CRCP calibration coefficients were revised.

3.3.2 July 2020—PMED v2.6, Manual of Practice Integration

The manual of practice or MOP is integrated with the Pavement ME Design software. Users can select "Help – MOP Help" in the menu ribbon and then select a property in the application and the application will open the integrated manual of practice PDF or addendum to the appropriate location.

3.3.3 July 2018—PMED v2.5.0, Manual of Integration

The manual of practice or MoP is now integrated with the Pavement ME Design software. Users can now select "Help – MOP Help" in the menu ribbon and then select a property in the application and the application will open the integrated manual of practice PDF or addendum to the appropriate location.

3.3.4 July 2018—PMED v2.5.0, Maintenance Strategy Tool Enhancement

Users now have access to a single shot maintenance strategy which affects the projects performance parameters during an analysis run for specific surface treatments for rigid and flexible pavements. Only "non-structural" maintenance strategies are currently available. The results of applying the maintenance strategy are included in the PDF and Excel output reports.

3.3.5 July 2016—PMED v2.3.0, Climate Database Update, NARR

Starting with version 2.3.0 of AASHTOWare Pavement ME Design, the generated climate data files will be based on the NARR dataset model for flexible and rigid pavements. The NARR project is an extension of the NCEP Global Reanalysis which is run over the North American Region. The NARR model uses the very high resolution NCEP Eta Model (32km/45 layer) together with the Regional Data Assimilation System (RDAS) which, significantly, assimilates precipitation along with other variables. The improvements in the model/assimilation have resulted in a dataset with substantial improvements in the accuracy of temperature, winds and precipitation compared to the NCEP-DOE Global Reanalysis 2. NARR output data includes 8 times daily data at 29 levels and all weather variables required by ME Design.

3.3.6 August 2015—PMED v2.2, Inclusion of New PCC Pavement Model Calibration Coefficients

The software is now fully integrated with the revised calibration coefficients from NCHRP Project 20-24 (Task 388).

3.3.7 July 2014—PMED V2.1.22, Enhanced help documentation

HTML Help is now context sensitive for most modules in the software. Users can now click on a row in a property grid and be directed to the appropriate place in the help document.

3.4 Semi-Rigid Pavements

The following summarizes the changes made to the software for the flexible or asphalt pavement design strategy in chronological order since 2014.

3.4.1 July 2022—PMED v3.0, Web-Based Application

The flexible pavement web-based application was released in July 2022. Various updates were made to the software based on the guidance from the TRT. The predicted distresses for the asphalt pavement design strategy are the same as for v2.6.6; no changes were made to the software that had an impact on the calculated flexible pavement distresses.

3.4.2 July 2020—PMED v2.6, Manual of Practice Integration

The manual of practice or MOP is integrated with the Pavement ME Design software. Users can select "Help – MOP Help" in the menu ribbon and then select a property in the application and the application will open the integrated manual of practice PDF or addendum to the appropriate location.

3.4.3 July 2020—PMED v2.6, Inclusion of Top-Down Fatigue Cracking

The NCHRP 1-42 fracture-based product for top-down cracking in the asphalt wearing surface was integrated into the PMED software. The existing repeated load bending fatigue cracking prediction model and transfer functions were replaced with a fracture mechanics-based top-down fatigue cracking model and transfer functions.

The other change included in this version related to top-down cracking was the outcome from the PMED software for top-down cracking. The predicted variable is percent cracking of the total lane area. Top-down fatigue cracks can be a combination of longitudinal and alligator cracks. In earlier versions of the software the outcome variable was length of longitudinal cracks in the wheel path.

3.4.4 July 2018—PMED v2.5.0, Manual of Integration

The manual of practice or MoP is now integrated with the Pavement ME Design software. Users can now select "Help – MOP Help" in the menu ribbon and then select a property in the application and the application will open the integrated manual of practice PDF or addendum to the appropriate location.

3.4.5 July 2018—PMED v2.5.0, Maintenance Strategy Tool Enhancement

Users now have access to a single shot maintenance strategy which affects the projects performance parameters during an analysis run for specific surface treatments for rigid and flexible pavements. Only "non-structural" maintenance strategies are currently available. The results of applying the maintenance strategy are included in the PDF and Excel output reports.

3.4.6 July 2018—PMED v2.5.0, Recalibration

New flexible and flexible rehab pavement designs (including semi-rigid) have undergone recalibration, as a result of the technical audit changes and the new MERRA-2 climate data set for asphalt surfaced pavements.

3.4.7 July 2018—PMED v2.5.0, Integration of MERRA Climate Data for Flexible Pavements

Flexible designs have now been calibrated to use the MERRA-2 data set. Users can download climatic HCD files from the InfoPave site https://infopave.fhwa.dot.gov/Tools/MEPDGInputsFromMERRA or by selecting a project location from a map based input in the updated climate tab. The application will not allow rigid designs to be run with the MERRA data set as they have not yet been calibrated for that climate data. For more information on the available climatic data sets and their application in Pavement ME Design, please see the climatic addendum at http://me-design.com/MEDesign/Download.aspx under the "Addendums to the Manual of Practice" tab.

3.4.8 July 2018—PMED v2.5.0, Tensile Strength for Level 1 Inputs

Input level 1 is now available in the user interface for entering tensile strength data. Level 1 inputs are used to predict the change in tensile strength over different temperatures. The Molinaar default relationship between tensile strength and temperature have been added to the software. Users may now enter different tensile strengths with different temperatures.

3.4.9 July 2016—PMED v2.3.0, Climate Database Update, NARR

Starting with version 2.3.0 of AASHTOWare Pavement ME Design, the generated climate data files will be based on the NARR dataset model for flexible and rigid pavements. The NARR project is an extension of the NCEP Global Reanalysis which is run over the North American Region. The NARR model uses the very high resolution NCEP Eta Model (32km/45 layer) together with the Regional Data Assimilation System (RDAS) which, significantly, assimilates precipitation along with other variables. The improvements in the model/assimilation have resulted in a dataset with substantial improvements in the accuracy of temperature, winds and precipitation compared to the NCEP-DOE Global Reanalysis 2. NARR output data includes 8 times daily data at 29 levels and all weather variables required by ME Design.

3.4.10 August 2015—PMED v2.2, Inclusion of NCHRP 1-41 Reflection Cracking Model

The software has successfully integrated with the NCHRP 1-41 reflection cracking model. These alterations bring big changes to existing designs and are heavily detailed and described in the help document. The following additional design types are included in this release:

- New Semi-Rigid Pavement: A semi-rigid pavement is composed of a flexible layer (e.g., HMA) and a rigid layer (e.g., cement-treated base [CTB], cement stabilized base [CSB], rolled-compacted concrete [RCC], or lean mix concrete).
- AC Overlay of Existing Semi-Rigid Pavement: This is the placement of an AC overlay over an existing semi-rigid pavement.

Detailed information on the additional design types and enhanced design capabilities (new inputs, performance criteria, new prediction models and algorithms, model calibration coefficients, and reliability) are presented in the AASHTOWare Pavement ME Design Software Help System.

3.4.11 July 2014—PMED v 2.1.22, Inclusion of Subgrade Modulus in Sensitivity Analysis

Users can now enter the subgrade moduli in the sensitivity analysis and run sensitivity for the selected layers.

3.4.12 July 2014—PMED V2.1.22, Enhanced help documentation

HTML Help is now context sensitive for most modules in the software. Users can now click on a row in a property grid and be directed to the appropriate place in the help document.

3.4.13 January 2014—PMED v2.0.19, Layer by Layer Asphalt Rutting

The layer-by-layer asphalt rutting coefficients are now available for analysis purposes. The application defaults to using the project single asphalt layer rutting calibration coefficients as the default value for the multi-layer rutting coefficients. Please see the help manual for a more detailed explanation of layer-by-layer rutting changes.

3.5 Asphalt Overlays of Asphalt and Semi-Rigid Pavements

The following summarizes the changes made to the software for the flexible or asphalt pavement design strategy in chronological order since 2014.

3.5.1 July 2023—PMED v3.15, Multiple Asphalt Overlays

The software now allows multiple AC overlays on asphalt and semi-rigid pavement types, up to a limit of four different AC layer types, including those specified in the existing pavements.

3.5.2 July 2022—PMED v3.0, Web-Based Application

The flexible pavement web-based application was released in July 2022. Various updates were made to the software based on the guidance from the TRT. The predicted distresses for the asphalt pavement design strategy are the same as for v2.6.6; no changes were made to the software that had an impact on the calculated flexible pavement distresses.

3.5.3 July 2020—PMED v2.6, Manual of Practice Integration

The manual of practice or MOP is integrated with the Pavement ME Design software. Users can select "Help – MOP Help" in the menu ribbon and then select a property in the application and the application will open the integrated manual of practice PDF or addendum to the appropriate location.

3.5.4 July 2020—PMED v2.6, Inclusion of Top-Down Fatigue Cracking

The NCHRP 1-42 fracture-based product for top-down cracking in the asphalt wearing surface was integrated into the PMED software. The existing repeated load bending fatigue cracking prediction model and transfer functions were replaced with a fracture mechanics-based top-down fatigue cracking model and transfer functions.

The other change included in this version related to top-down cracking was the outcome from the PMED software for top-down cracking. The predicted variable is percent cracking of the total lane area. Top-down fatigue cracks can be a combination of longitudinal and alligator cracks. In earlier versions of the software the outcome variable was length of longitudinal cracks in the wheel path.

3.5.5 July 2018—PMED v2.5.0, Manual of Integration

The manual of practice or MoP is now integrated with the Pavement ME Design software. Users can now select "Help – MOP Help" in the menu ribbon and then select a property in the application and the application will open the integrated manual of practice PDF or addendum to the appropriate location.

3.5.6 July 2018—PMED v2.5.0, Maintenance Strategy Tool Enhancement

Users now have access to a single shot maintenance strategy which affects the projects performance parameters during an analysis run for specific surface treatments for rigid and flexible pavements. Only "non-structural" maintenance strategies are currently available. The results of applying the maintenance strategy are included in the PDF and Excel output reports.

3.5.7 July 2018—PMED v2.5.0, Recalibration

New flexible and flexible rehab pavement designs (including semi-rigid) have undergone recalibration, as a result of the technical audit changes and the new MERRA-2 climate data set for asphalt surfaced pavements.

3.5.8 July 2018—PMED v2.5.0, Integration of MERRA Climate Data for Flexible Pavements

Flexible designs have now been calibrated to use the MERRA-2 data set. Users can download climatic HCD files from the InfoPave site https://infopave.fhwa.dot.gov/Tools/MEPDGInputsFromMERRA or by selecting a project location from a map based input in the updated climate tab. The application will not allow rigid designs to be run with the MERRA data set as they have not yet been calibrated for that climate data. For more information on the available climatic data sets and their application in Pavement ME Design, please see the climatic addendum at http://me-design.com/MEDesign/Download.aspx under the "Addendums to the Manual of Practice" tab.

3.5.9 July 2018—PMED v2.5.0, Tensile Strength for Level 1 Inputs

Input level 1 is now available in the user interface for entering tensile strength data. Level 1 inputs are used to predict the change in tensile strength over different temperatures. The Molinaar default relationship between tensile strength and temperature have been added to the software. Users may now enter different tensile strengths with different temperatures.

3.5.10 July 2016—PMED v2.3.0, Climate Database Update, NARR

Starting with version 2.3.0 of AASHTOWare Pavement ME Design, the generated climate data files will be based on the NARR dataset model for flexible and rigid pavements. The NARR project is an extension of the NCEP Global Reanalysis which is run over the North American Region. The NARR model uses the very high resolution NCEP Eta Model (32km/45 layer) together with the Regional Data Assimilation System (RDAS) which, significantly, assimilates precipitation along with other variables. The improvements in the model/assimilation have resulted in a dataset with substantial improvements in the accuracy of temperature, winds and precipitation compared to the NCEP-DOE Global Reanalysis 2. NARR output data includes 8 times daily data at 29 levels and all weather variables required by ME Design.

3.5.11 August 2015—PMED v2.2, Inclusion of NCHRP 1-41 Reflection Cracking Model

The software has successfully integrated with the NCHRP 1-41 reflection cracking model. These alterations bring big changes to existing designs and are heavily detailed and described in the help document. The following additional design types are included in this release:

- New Semi-Rigid Pavement: A semi-rigid pavement is composed of a flexible layer (e.g., HMA) and a rigid layer (e.g., cement-treated base [CTB], cement stabilized base [CSB], rolled-compacted concrete [RCC], or lean mix concrete).
- AC Overlay of Existing Semi-Rigid Pavement: This is the placement of an AC overlay over an existing semi-rigid pavement.

The software has successfully integrated with the NCHRP 1-41 reflection cracking model. These alterations bring big changes to existing designs and are heavily detailed and described in the help document. This release includes enhanced capabilities for the following design types:

- AC Overlay of Existing AC Pavements.
- AC Overlay of Existing Intact JPCP.
- AC Overlay of Existing Intact CRCP.
- AC Overlay of Fractured JPCP.
- AC Overlay of Fractured CRCP.

Detailed information on the additional design types and enhanced design capabilities (new inputs, performance criteria, new prediction models and algorithms, model calibration coefficients, and reliability) are presented in the AASHTOWare Pavement ME Design Software Help System.

3.5.12 July 2014—PMED V2.1.22, Enhanced help documentation

HTML Help is now context sensitive for most modules in the software. Users can now click on a row in a property grid and be directed to the appropriate place in the help document.

3.5.13 January 2014—PMED v2.0.19, Layer by Layer Asphalt Rutting

The layer-by-layer asphalt rutting coefficients are now available for analysis purposes. The application defaults to using the project single asphalt layer rutting calibration coefficients as the default value for the multi-layer rutting coefficients. Please see the help manual for a more detailed explanation of layer-by-layer rutting changes.

3.6 Asphalt Overlays of JPCP, CRCP, and Fractured JPCP

The following summarizes the changes made to the software for the flexible or asphalt pavement design strategy in chronological order since 2014.

3.6.1 July 2023—PMED v3.15, Multiple Asphalt Overlays

The software now allows multiple AC overlays on JPCP, CRCP, and fractured JPCP up to a limit of four different AC layer types.

3.6.2 July 2022—PMED v3.0, Web-Based Application

The asphalt overlay web-based application was released in July 2022. Various updates were made to the software based on the guidance from the TRT. The predicted distresses for the asphalt overlay design strategy are the same as for v2.6.6; no changes were made to the software that had an impact on the calculated flexible pavement distresses. The calibration coefficients derived for new JPCP and CRCP are applied to the existing PCC slabs with an asphalt overlay.

3.6.3 July 2020—PMED v2.6, Manual of Practice Integration

The manual of practice or MOP is integrated with the Pavement ME Design software. Users can select "Help – MOP Help" in the menu ribbon and then select a property in the application and the application will open the integrated manual of practice PDF or addendum to the appropriate location.

3.6.4 July 2020—PMED v2.6, Inclusion of Top-Down Fatigue Cracking

The NCHRP 1-42 fracture-based product for top-down cracking in the asphalt wearing surface was integrated into the PMED software. The existing repeated load bending fatigue cracking prediction model and transfer functions were replaced with a fracture mechanics-based top-down fatigue cracking model and transfer functions.

The other change included in this version related to top-down cracking was the outcome from the PMED software for top-down cracking. The predicted variable is percent cracking of the total lane area. Top-down fatigue cracks can be a combination of longitudinal and alligator cracks. In earlier versions of the software the outcome variable was length of longitudinal cracks in the wheel path.

3.6.5 July 2018—PMED v2.5.0, Manual of Integration

The manual of practice or MoP is now integrated with the Pavement ME Design software. Users can now select "Help – MOP Help" in the menu ribbon and then select a property in the application and the application will open the integrated manual of practice PDF or addendum to the appropriate location.

3.6.6 July 2018—PMED v2.5.0, Maintenance Strategy Tool Enhancement

Users now have access to a single shot maintenance strategy which affects the projects performance parameters during an analysis run for specific surface treatments for rigid and flexible pavements. Only "non-structural" maintenance strategies are currently available. The results of applying the maintenance strategy are included in the PDF and Excel output reports.

3.6.7 July 2018—PMED v2.5.0, Recalibration

New flexible and flexible rehab pavement designs (including semi-rigid) have undergone recalibration, as a result of the technical audit changes and the new MERRA-2 climate data set for asphalt surfaced pavements.

3.6.8 July 2018—PMED v2.5.0, Integration of MERRA Climate Data for Flexible Pavements

Flexible designs have now been calibrated to use the MERRA-2 data set. Users can download climatic HCD files from the InfoPave site https://infopave.fhwa.dot.gov/Tools/MEPDGInputsFromMERRA or by selecting a project location from a map based input in the updated climate tab. The application will not allow rigid designs to be run with the MERRA data set as they have not yet been calibrated for that climate data. For more information on the available climatic data sets and their application in Pavement ME Design, please see the climatic addendum at http://me-design.com/MEDesign/Download.aspx under the "Addendums to the Manual of Practice" tab.

3.6.9 July 2018—PMED v2.5.0, Tensile Strength for Level 1 Inputs

Input level 1 is now available in the user interface for entering tensile strength data. Level 1 inputs are used to predict the change in tensile strength over different temperatures. The Molinaar default relationship between tensile strength and temperature have been added to the software. Users may now enter different tensile strengths with different temperatures.

3.6.10 July 2016—PMED v2.3.0, Climate Database Update, NARR

Starting with version 2.3.0 of AASHTOWare Pavement ME Design, the generated climate data files will be based on the NARR dataset model for flexible and rigid pavements. The NARR project is an extension of the NCEP Global Reanalysis which is run over the North American Region. The NARR model uses the very high resolution NCEP Eta Model (32km/45 layer) together with the Regional Data Assimilation System (RDAS) which, significantly, assimilates precipitation along with other variables. The improvements in the model/assimilation have resulted in a dataset with substantial improvements in the accuracy of temperature, winds and precipitation compared to the NCEP-DOE Global Reanalysis 2. NARR output data includes 8 times daily data at 29 levels and all weather variables required by ME Design.

3.6.11 August 2015—PMED v2.2, Inclusion of NCHRP 1-41 Reflection Cracking Model

The software has successfully integrated with the NCHRP 1-41 reflection cracking model. These alterations bring big changes to existing designs and are heavily detailed and described in the help document. This release includes enhanced capabilities for the following design types:

- AC Overlay of Existing AC Pavements.
- AC Overlay of Existing Intact JPCP.
- AC Overlay of Existing Intact CRCP.
- AC Overlay of Fractured JPCP.

- AC Overlay of Fractured CRCP.

Detailed information on the additional design types and enhanced design capabilities (new inputs, performance criteria, new prediction models and algorithms, model calibration coefficients, and reliability) are presented in the AASHTOWare Pavement ME Design Software Help System.

3.6.12 August 2015—PMED v2.2, Inclusion of New PCC Pavement Model Calibration Coefficients

The software is now fully integrated with the revised calibration coefficients from NCHRP Project 20-24 (Task 388).

3.6.13 July 2014—PMED V2.1.22, Enhanced help documentation

HTML Help is now context sensitive for most modules in the software. Users can now click on a row in a property grid and be directed to the appropriate place in the help document.

3.6.14 January 2014—PMED v2.0.19, Layer by Layer Asphalt Rutting

The layer-by-layer asphalt rutting coefficients are now available for analysis purposes. The application defaults to using the project single asphalt layer rutting calibration coefficients as the default value for the multi-layer rutting coefficients. Please see the help manual for a more detailed explanation of layer-by-layer rutting changes.

3.7 Bonded PCC Overlays of JPCP and CRCP and Unbonded PCC Overlays of JPCP and CRCP

The following summarizes the changes made to the software for the flexible or asphalt pavement design strategy in chronological order since 2014.

3.7.1 July 2022—PMED v3.0 Web-Based Application

The rigid pavement overlay web-based application was released in July 2022. Various updates were made to the software based on the guidance from the TRT. The following summarizes the enhancements made to the software in FY 2022, which were confined to the rigid pavement design models and transfer functions.

- Integration of the NCHRP 1-51 product on PCC slab – aggregate base friction degradation.
- Application and use of the MERRA2 climate dataset for designing rigid pavements. All pavement design strategies now use the MERRA2 climate dataset.

The MERRA2 climate dataset and the integration of the NCHRP 1-51 product did have a minor impact on the rigid pavement overlay distresses, but the differences were minor and had no significant impact on the PCC overlay calibration coefficients set for JPCP and CRCP.

3.7.2 July 2020—PMED v2.6, Manual of Practice Integration

The manual of practice or MOP is integrated with the Pavement ME Design software. Users can select “Help – MOP Help” in the menu ribbon and then select a property in the application and the application will open the integrated manual of practice PDF or addendum to the appropriate location.

3.7.3 July 2018—PMED v2.5.0, Manual of Integration

The manual of practice or MoP is now integrated with the Pavement ME Design software. Users can now select "Help – MOP Help" in the menu ribbon and then select a property in the application and the application will open the integrated manual of practice PDF or addendum to the appropriate location.

3.7.4 July 2018—PMED V2.5.0, Maintenance Strategy Tool Enhancement

Users now have access to a single shot maintenance strategy which affects the projects performance parameters during an analysis run for specific surface treatments for rigid and flexible pavements. Only "non-structural" maintenance strategies are currently available. The results of applying the maintenance strategy are included in the PDF and Excel output reports.

3.7.5 July 2016—PMED v2.3.0, Climate Database Update, NARR

Starting with version 2.3.0 of AASHTOWare Pavement ME Design, the generated climate data files will be based on the NARR dataset model for flexible and rigid pavements. The NARR project is an extension of the NCEP Global Reanalysis which is run over the North American Region. The NARR model uses the very high resolution NCEP Eta Model (32km/45 layer) together with the Regional Data Assimilation System (RDAS) which, significantly, assimilates precipitation along with other variables. The improvements in the model/assimilation have resulted in a dataset with substantial improvements in the accuracy of temperature, winds and precipitation compared to the NCEP-DOE Global Reanalysis 2. NARR output data includes 8 times daily data at 29 levels and all weather variables required by ME Design.

3.7.6 August 2015—PMED v2.2, Inclusion of New PCC Pavement Model Calibration Coefficients

The software is now fully integrated with the revised calibration coefficients from NCHRP Project 20-24 (Task 388).

3.7.7 July 2014—PMED V2.1.22, Enhanced help documentation

HTML Help is now context sensitive for most modules in the software. Users can now click on a row in a property grid and be directed to the appropriate place in the help document.

3.8 SJPCP Overlay Design

The following summarizes the changes made to the software for the SJPCP rehabilitation design strategy in chronological order since it was integrated into the PMED software in 2016, v2.3.0.

3.8.1 July 2022—PMED v3.0 Web-Based Application

The SJPCP web-based application was released in July 2022. Various updates were made to the software based on the guidance from the TRT. The following summarizes the enhancements made to the software in FY 2022, which were confined to the rigid pavement design models and transfer functions.

- Integration of the NCHRP 1-51 product on PCC slab – aggregate base friction degradation.
- Application and use of the MERRA2 climate dataset for designing rigid pavements. All pavement design strategies now use the MERRA2 climate dataset.

The MERRA2 climate dataset and the integration of the NCHRP 1-51 product did have a minor impact on the SJPCP predicted distresses, but the differences were minor and had no significant impact on the SJPCP calibration coefficients.

3.8.2 July 2020—PMED v2.6, Manual of Practice Integration

The manual of practice or MOP is integrated with the Pavement ME Design software. Users can select "Help – MOP Help" in the menu ribbon and then select a property in the application and the application will open the integrated manual of practice PDF or addendum to the appropriate location.

3.8.3 July 2018—PMED v2.5.0, Manual of Integration

The manual of practice or MoP is now integrated with the Pavement ME Design software. Users can now select "Help – MOP Help" in the menu ribbon and then select a property in the application and the application will open the integrated manual of practice PDF or addendum to the appropriate location.

3.8.4 July 2018—PMED v2.5.0, Maintenance Strategy Tool Enhancement

Users now have access to a single shot maintenance strategy which affects the projects performance parameters during an analysis run for specific surface treatments for rigid and flexible pavements. Only "non-structural" maintenance strategies are currently available. The results of applying the maintenance strategy are included in the PDF and Excel output reports.

3.8.5 July 2016—PMED v2.3.0, Climate Database Update, NARR

Starting with version 2.3.0 of AASHTOWare Pavement ME Design, the generated climate data files will be based on the NARR dataset model for flexible and rigid pavements. The NARR project is an extension of the NCEP Global Reanalysis which is run over the North American Region. The NARR model uses the very high resolution NCEP Eta Model (32km/45 layer) together with the Regional Data Assimilation System (RDAS) which, significantly, assimilates precipitation along with other variables. The improvements in the model/assimilation have resulted in a dataset with substantial improvements in the accuracy of temperature, winds and precipitation compared to the NCEP-DOE Global Reanalysis 2. NARR output data includes 8 times daily data at 29 levels and all weather variables required by ME Design.

3.8.6 July 2016—PMED v2.3.0, Inclusion of the SPJCP Design Strategy

The SJPCP rehabilitation design strategy of flexible pavements was integrated into the software. Prior to v2.3.0, the rehabilitation design was not available in the PMED software.