



Mechanistic–Empirical Pavement Design Guide

~ A Manual of Practice ~





2026 • Fourth Edition

AASHTO®
American Association of State Highway and Transportation Officials





Mechanistic–Empirical Pavement Design Guide

~ *A Manual of Practice* ~

4





2026 • Fourth Edition

AASHTO®

American Association of State Highway and Transportation Officials

© 2026 by the American Association of State Highway and Transportation Officials.
All rights reserved. Duplication is a violation of applicable law.

AASHTO | American Association of State Highway and Transportation Officials

American Association of State Highway and Transportation Officials
555 12th Street NW, Suite 1000
Washington, DC 20004
202-624-5800
www.transportation.org

© 2026, by American Association of State Highway and Transportation Officials. All rights reserved. Duplication is a violation of applicable law.

No content contained in this publication may be entered or used in conjunction with any artificial intelligence tool or program without the express written permission of AASHTO.

Printed in the United States of America.

Publication Code: MEPDG-4 ISBN: 978-1-56051-839-6

© 2026 by the American Association of State Highway and Transportation Officials.
All rights reserved. Duplication is a violation of applicable law.

2025-2026

Executive Committee

President
Russell McMurry, Georgia*

Vice President
Marc Williams, Texas*

Treasurer
Justin Powell, South Carolina

Executive Director
Jim Tymon, AASHTO

Region I
Marie Therese Dominguez, New York
Michael B. Carroll, Pennsylvania

Region II
Justin Powell, South Carolina
Daniel Johnson, North Carolina

Region III
Brad Wieferich, Michigan
Ed Hassinger, Missouri

Region IV
Marc Williams, Texas
Vicki Kramer, Nebraska

Immediate Past President
Garrett Eucalitto, Connecticut

* Elected at the 2025 Annual Meeting in Salt Lake City, Utah

© 2026 by the American Association of State Highway and Transportation Officials.
All rights reserved. Duplication is a violation of applicable law.

This page intentionally left blank.

© 2026 by the American Association of State Highway and Transportation Officials.
All rights reserved. Duplication is a violation of applicable law.

2025-2026

Committee on Materials and Pavements

Chair
Matt Linneman, North Dakota

Vice Chair
Curt Turgeon, Minnesota

Alabama
Scott George
Kaye Davis
Steven Ingram

Alaska
Michael San Angelo
Matthew Billings
Andrew Pavey

Arizona
Jesús Sandoval-Gil

Arkansas
Paul Tinsley
Dwayne Cale
Sarah Tamayo

California
Richard Foley
Dulce Feldman
Tigi Thomas

Colorado
Craig Wieden
Vincent Battista
Eric Prieve

Connecticut
Eliana Carlson
Chris Angelotti

Delaware
Jay Evans
Mark Buckalew
Catherine Schwander

District of Columbia
Rezene Medhani
Jason Griffin
Andrew Kaufmann

Florida
Sue Zheng
Cassady Allen
Mary Jane Hayden
Howie Moseley

Georgia
Ian Rish
Patrick Allen

Hawaii
Mel Chung

Idaho
Chad Clawson
John Arambarri
Mike Copeland

Illinois
Brian Pfeifer
John Senger
Andrew Stolba

Indiana
Matthew Beeson
Jim Reilman
Kurt Sommer

Iowa
Jeff De Vries
Chris Brakke
Ashley Buss

© 2026 by the American Association of State Highway and Transportation Officials.
All rights reserved. Duplication is a violation of applicable law.

Kansas
Richard Barezinsky
Christopher Leibrock

Kentucky
Allen Myers
Brandi Babatunde
Gregory Garner

Louisiana
Kris Wascom
Jason Davis
Justin Morris

Maine
James Robinson

Maryland
Eric Frempong
Praveen Desaraju
Intikhab Haider

Massachusetts
Jason Robertson
Bryan Engstrom
Edmund Naras

Michigan
Kevin Kennedy
Christopher Byrum
Michael Eacker

Mississippi
Griffin Sullivan

Missouri
Brett Trautman
Brandi Baldwin
Jason Blomberg
Lori Greer

Montana
Matt Needham
Jim Davies

Nebraska
Brendon Schmidt
Wally Heyen

Nevada
Nathan Morian
Michael Griswold

New Hampshire
Joseph Blair
Eric Thibodeau

New Jersey
Edward Inman
Nusrat Morshed
Kevin Sereni

New Mexico
Kelly Montoya
Can Chen
Hashem Faidi

New York
Christopher Euler
Tom Kane
Brendan Rock

North Carolina
Todd Whittington
Patrick Norman
Shihai Zhang

North Dakota
Amy Beise
Tyler Wollmuth
Scott Wutzke

Ohio
Daniel Miller
Patrick Bierl
Craig Landefeld

Oklahoma
Matt Romero
Bryce Hanlon
Kenny Seward
Tracy Terrill

Oregon
Larry Ilg
Christopher Duman

Pennsylvania
Garth Bridenbaugh
Timothy Ramirez

Puerto Rico
Carlos Hernandez
Miguel Estrella
Alexander Garcia

Rhode Island
Jose Lima
Michael Byrne

South Carolina
Merrill Zwanka
Christopher (Eric) Carroll, Jr.
Temple Short

South Dakota
Tanner Fitzke
Darin Hodges
Shea Lemmel

Tennessee
Heather Purdy
Michael Doran
Danny Lane

Texas
Ryan Barborak
Jenny Li
Enad Mahmoud

© 2026 by the American Association of State Highway and Transportation Officials.
All rights reserved. Duplication is a violation of applicable law.

Utah
Ken Talbot
Howard Anderson
Jason Richins

Vermont
Matt DiGiovanni
Ian Anderson
Aaron Schwartz

Virginia
Charles Babish

Washington State
Kurt Williams

West Virginia
Michael Mance
Vincent Allison
Dohn Lough

Wisconsin
Erik Lyngdal
Tirupan Mandal

Wyoming
Greg Milburn
Wes Bybee

Associate Members—International

Ontario
Anne Holt

Quebec
Felix Doucet

AASHTO

Ryan Fragapane
Brian Johnson
Brian Korschgen
Robert Lutz
John Malusky
Katheryn Malusky
Sonya Puterbaugh
Amy Reed
Casey Soneira
Courtney Wallace

Ex Officio—Federal Highway Administration
Gina Ahlstrom
David Mensching
Jean Nehme

GGFGA
Georgene Geary

Mark Felag, P.E., LLC
Mark Felag

© 2026 by the American Association of State Highway and Transportation Officials.
All rights reserved. Duplication is a violation of applicable law.

This page intentionally left blank.

© 2026 by the American Association of State Highway and Transportation Officials.
All rights reserved. Duplication is a violation of applicable law.

2025-2026

Technical Subcommittee 5d, Pavement Design

Chair
Dulce Rufino Feldman, California

Vice Chair
Mary Jane Hayden, Florida

Members
Scott George, Alabama
Taylor Janney, Alabama
Nourali Zareh, Arizona
Craig Wieden, Colorado
Steven Norton, Connecticut
Robin Davis, Delaware
Kyle Kroodsma, Florida
Ohhoon Kwon, Florida
Ian Rish, Georgia
John Arambarri, Idaho
Kumar Dave, Indiana
Chris Brakke, Iowa
Richard Barezinsky, Kansas
Greg Schieber, Kansas
Adam Ross, Kentucky
Jeffrey Lambert, Louisiana
Geoff Hall, Maryland
Eric Frempong, Maryland
Bryan Engstrom, Massachusetts
Edmund Naras, Massachusetts
Jason Robertson, Massachusetts
Kevin Kennedy, Michigan
Curt Turgeon, Minnesota
Sullivan Griffin, Mississippi
Brandon Voyles, Missouri
Eric Thibodeau, New Hampshire
Hashem Faidi, New Mexico
Russell Thielke, New York
Shihai Zhang, North Carolina
Amy Beise, North Dakota
Patrick Bierl, Ohio
Craig Landefeld, Ohio
Lydia Peddicord, Pennsylvania
Matthew Chandler, Tennessee
Michael Doran, Tennessee
Ulises Martinez, Tennessee
Ruben Carrasco, Texas
Ken Talbot, Utah
Ian Anderson, Vermont
Julie Nakamura, Vermont
Karen Carlie, Washington State
Dohn Lough, West Virginia

Associate Members—International
Anne Holt, Ontario
Stephen Lee, Ontario
Felix Doucet, Quebec

Ex Officio—Federal Highway Administration
Tom Yu

AASHTO
Casey Soneira, Liaison
Ryan Fragapane, AASHTOWare
Katheryn Malusky, AASHTO Product Evaluation and Audit Solutions
Ben Sade, AASHTOWare

GGFGA
Georgene Geary

Mark Felag, P.E., LLC
Mark Felag

© 2026 by the American Association of State Highway and Transportation Officials.
All rights reserved. Duplication is a violation of applicable law.

This page intentionally left blank.

© 2026 by the American Association of State Highway and Transportation Officials.
All rights reserved. Duplication is a violation of applicable law.

Preface

This document or manual of practice describes a pavement design methodology that is based on engineering mechanics and has been validated with extensive road test performance data. This methodology is termed mechanistic–empirical (ME) pavement design.

Transportation agencies have achieved varying levels of ME implementation using the AASHTOWare Pavement M-E Design (PMED) program, since the first edition of this manual, referred to as the Mechanistic–Empirical Pavement Design Guide (AASHTO MEPDG), was published in 2008, with some going as far as fully incorporating PMED for regular pavement design production. This edition of the AASHTO MEPDG supports agencies in the midst of learning pavement design ME principles for their ongoing implementation efforts, as well as providing necessary technical reference guidance for more experienced agencies. The AASHTO MEPDG presents the information necessary for pavement design engineers to use the ME-based design and analysis method. The software supporting this method is called Pavement ME Design® and is commercially available through AASHTOWare. The software is referred to in this document as PMED.

Multiple enhancements have been made to PMED based on completed research projects sponsored by the National Cooperative Highway Research Program (NCHRP) and the Federal Highway Administration (FHWA). In addition, revisions to the software were based on evaluations performed by state departments of transportation and others in the community of practice. The fourth edition of the AASHTO MEPDG was prepared so the manual was consistent with the enhanced features and models included in the software through 2026.

The following table (Table P-1) summarizes the key differences noted between the format and calibration factors used in the major updates to the software from MEPDG version 1.1 through AASHTOWare Pavement ME Design®software version 3.0.

© 2026 by the American Association of State Highway and Transportation Officials.
All rights reserved. Duplication is a violation of applicable law.

Table P-1. Summary of Key Differences in Software Format and Calibration Factors

Format, Transfer Functions, and Calibration Coefficients	MEPDG version 1.1	AASHTOWare PMED version 2.3.1	AASHTOWare PMED version 2.5.3	AASHTOWare Pavement ME Design version 2.6	AASHTOWare Pavement ME Design version 3.0
Application Type	Desktop version	Desktop version	Desktop version	Desktop 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 Whether It Is Included in Output Summary	Data from ground-based weather stations; output summary NOT included.	Data from North American Regional Reanalysis (NARR) database[a] for rigid and flexible pavements; output summary included.	Data from NARR database[a] for rigid pavements, and MERRA2 database[b] for flexible and semi-rigid pavements; output summary included.	Data from NARR database[a] for rigid pavements, and MERRA2 database[b] for flexible and semi-rigid pavements; output summary included.	Data from MERRA2 database[b] 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 portland cement concrete (PCC) pavements because of issue with coefficient of thermal expansion (CTE) values in the Long Term Pavement Performance (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 (Khazanovich and Tompkins, 2017) interface friction varies through design life.
Coefficient of CTE in AASHTO MEPDG	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

Continued on next page.

© 2026 by the American Association of State Highway and Transportation Officials.
All rights reserved. Duplication is a violation of applicable law.

Table P-1. Summary of Key Differences in Software Format and Calibration Factors, *continued*

Format, Transfer Functions, and Calibration Coefficients		MEPDG version 1.1	AASHTOWare PMED version 2.3.1	AASHTOWare PMED version 2.5.3	AASHTOWare Pavement ME Design version 2.6	AASHTOWare Pavement ME Design version 3.0
PCC Zero Stress Temperature in AASHTO MEPDG		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	k_{s1} of 1.673	k_{s1} of 2.03	k_{s1} of 0.965	k_{s1} of 0.965	k_{s1} of 0.965
	Coarse-Grained Soil			k_{s1} of 0.965	k_{s1} of 0.965	k_{s1} of 0.965
	Sand Soil			k_{s1} of 0.635	k_{s1} of 0.635	k_{s1} of 0.635
	Fine-Grained Soil	k_{s1} of 1.35	k_{s1} of 1.35	k_{s1} of 0.675	k_{s1} of 0.675	k_{s1} of 0.675
Global Calibration or Field-Adjustment Constant for Unbound Materials and Soils in Rutting Model; β_{s1}	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
Multiple Asphalt Layer Rut Depth Characterization		Excluded	Included	Included	Included	Included
Global Laboratory-Derived Model Coefficients in the Rut Depth Prediction Model		k_{r1} of –3.35412	k_{r1} of –3.35412	k_{r1} of –2.45	k_{r1} of –2.45	k_{r1} of –2.45
		k_{r2} of 1.5606	k_{r2} of 1.5606	k_{r2} of 3.01	k_{r2} of 3.01	k_{r2} of 3.01
		k_{r3} of 0.4791	k_{r3} of 0.4791	k_{r3} of 0.22	k_{r3} of 0.22	k_{r3} of 0.22

Continued on next page.

© 2026 by the American Association of State Highway and Transportation Officials.
All rights reserved. Duplication is a violation of applicable law.

Table P-1. Summary of Key Differences in Software Format and Calibration Factors, *continued*

Format, Transfer Functions, and Calibration Coefficients	MEPDG version 1.1	AASHTOWare PMED version 2.3.1	AASHTOWare PMED version 2.5.3	AASHTOWare Pavement ME Design version 2.6	AASHTOWare Pavement ME Design version 3.0
Global Local Calibration or Field-Adjustment Coefficients in the Rut Depth Prediction Model	β_{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_{f1} of 1.0	β_{f1} of 1.0	β_{f1} dependent on asphalt concrete (AC) thickness, see Note 1.	β_{f1} dependent on AC thickness, see Note 1.	β_{f1} dependent on AC thickness, see Note 1.
	β_{f2} of 1.0	β_{f2} of 1.0	β_{f2} of 1.38	β_{f2} of 1.38	β_{f2} of 1.38
	β_{f3} of 1.0	β_{f3} of 1.0	β_{f3} of 0.88	β_{f3} of 0.88	β_{f3} of 0.88
Global Bottom-Up Fatigue Cracking Transfer Function Coefficients	C_{f1} of 1.0	C_{f1} of 1.0	1.31	1.31	1.31
	C_{f2} of 1.0	C_{f2} of 1.0	C_{f2} dependent of AC thickness, see Note 2.	C_{f2} dependent of AC thickness, see Note 2.	C_{f2} dependent of AC thickness, see Note 2.
	C_{f3} of 6,000	C_{f3} of 6,000	C_{f3} of 6,000	C_{f3} of 6,000	C_{f3} of 6,000
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 (Lytton, Luo, Ling, et al., 2018); top-down cracks include longitudinal & alligator cracks.	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

Continued on next page.

© 2026 by the American Association of State Highway and Transportation Officials.
All rights reserved. Duplication is a violation of applicable law.

Table P-1. Summary of Key Differences in Software Format and Calibration Factors, *continued*

Format, Transfer Functions, and Calibration Coefficients	MEPDG version 1.1	AASHTOWare PMED version 2.3.1	AASHTOWare PMED version 2.5.3	AASHTOWare Pavement ME Design version 2.6	AASHTOWare Pavement ME Design version 3.0
Global Calibration or Field-Adjustment Constants for Top-Down Fatigue Cracking Prediction Model	β_{f1} of 1.0	β_{f1} of 1.0	β_{f1} of 1.0	—	—
	β_{f2} of 1.0	β_{f2} of 1.0	β_{f2} of 1.0	—	—
	β_{f3} of 1.0	$\beta_{f3}$of 1.0	β_{f3} of 1.0	—	—
Global Top-Down Fatigue Cracking Transfer Function Coefficients	C_{f1} of 7.00	C_{f1} of 7.00	C_{f1} of 7.00	C_1 of 2.5219	C_1 of 2.5219
	C_{f2} of 3.50	C_{f2} of 3.50	C_{f2} of 3.50	C_2 of 0.8069	C_2 of 0.8069
	C_{f3} of 1,000	C_{f3} of 1,000	C_{f3} of 1,000	C_3 of 1.00	C_3 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 mean annual air temperature (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.
Cement Treated Base (CTB) Fatigue Cracking Model Coefficients for Semi-Rigid Pavements	$k1$ of of 1.0	$k1$ of 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
	$\beta_{C1}$of 1.0	$\beta_{C1}$of 1.0	β_{C1} of 1.0	β_{C1} of 1.0	β_{C1} of 1.0
	β_{C2} of 1.0	β_{C2} of 1.0	β_{C2} of 1.0	β_{C2} of 1.0	β_{C2} of 1.0
Calibration Coefficients or Field Shift Factors for Fatigue Cracking of Semi-Rigid Pavements	C_1 of 1.0	C_1 of 1.0	C_1 of 0.0	C_1 of 0.0	C_1 of 0.0
	C_2 of 1.0	C_2 of 1.0	C_2 of 75	C_2 of 75	C_2 of 75
	C_3 of 0.0	C_3 of 0.0	C_3 of 2.0	C_3 of 2.0	C_3 of 2.0
	C_4 of 1,000	C_4 of 1,000	C_4 of 2.0	C_4 of 2.0	C_4 of 2.0
Calibration Coefficients in the Jointed Plain Concrete Pavement (JPCP) Fatigue Cracking Prediction Model	C_1 of 2.0	C_1 of 2.0	C_1 of 2.0	C_1 of 2.0	C_1 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

Continued on next page.

© 2026 by the American Association of State Highway and Transportation Officials.
All rights reserved. Duplication is a violation of applicable law.

Table P-1. Summary of Key Differences in Software Format and Calibration Factors, *continued*

Format, Transfer Functions, and Calibration Coefficients	MEPDG version 1.1	AASHTOWare PMED version 2.3.1	AASHTOWare PMED version 2.5.3	AASHTOWare Pavement ME Design version 2.6	AASHTOWare Pavement ME Design version 3.0
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
Calibration Coefficient in the Rigid Pavement Punchout Prediction Model	C_1 of 2.0	C_1 of 2.0	C_1 of 2.0	C_1 of 2.0	C_1 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
	α_{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
Short Jointed Plain Concrete Pavement (SJPCP) Overlay of Flexible Pavement Design Strategy	Excluded	Included	Included	Included	Included
Calibration Coefficients in the SJPCP 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 (Lytton, Tsai, Lee, et al. 2010)	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

Continued on next page.

© 2026 by the American Association of State Highway and Transportation Officials.
All rights reserved. Duplication is a violation of applicable law.

Table P-1. Summary of Key Differences in Software Format and Calibration Factors, *continued*

Format, Transfer Functions, and Calibration Coefficients		MEPDG version 1.1	AASHTOWare PMED version 2.3.1	AASHTOWare PMED version 2.5.3	AASHTOWare Pavement ME Design version 2.6	AASHTOWare Pavement ME Design version 3.0
Reflection Cracks of Flexible, JPCP, Continuously Reinforced Concrete Pavement (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
Transverse Reflection Cracks of Flexible Pavements	Calibration Factor, C_1	Regression equation	3.22	3.22	3.22	3.22
	Calibration Factor, C_2	Regression equation	25.7	25.7	25.7	25.7
	Calibration Factor, C_3	Regression equation	0.10	0.10	0.10	0.10
	Calibration Factor, C_4	Regression equation	133.4	133.4	133.4	133.4
	Calibration Factor, C_5	Regression equation	–72.4	–72.4	–72.4	–72.4
Transverse Reflection Cracks of JPCP	Calibration Factor, C_1	Regression equation	0.1	0.1	0.1	0.1
	Calibration Factor, C_2	Regression equation	0.52	0.52	0.52	0.52
	Calibration Factor, C_3	Regression equation	3.1	3.1	3.1	3.1
	Calibration Factor, C_4	Regression equation	79.5	79.5	79.5	79.5
	Calibration Factor, C_5	Regression equation	–2.71	–2.71	–2.71	–2.71
Transverse Reflection Cracks of CRCP & Fractured Slabs	Calibration Factor, C_1	Regression equation	1.0375	1.0375	1.0375	1.0375
	Calibration Factor, C_2	Regression equation	1.8929	1.8929	1.8929	1.8929
	Calibration Factor, C_3	Regression equation	0.1	0.1	0.1	0.1
	Calibration Factor, C_4	Regression equation	262.1	262.1	262.1	262.1
	Calibration Factor, C_5	Regression equation	–9.6645	–9.6645	–9.6645	–9.6645

Continued on next page.

© 2026 by the American Association of State Highway and Transportation Officials.
All rights reserved. Duplication is a violation of applicable law.

Table P-1. Summary of Key Differences in Software Format and Calibration Factors, *continued*

Format, Transfer Functions, and Calibration Coefficients		MEPDG version 1.1	AASHTOWare PMED version 2.3.1	AASHTOWare PMED version 2.5.3	AASHTOWare Pavement ME Design version 2.6	AASHTOWare Pavement ME Design version 3.0
Fatigue Reflection Cracks of Flexible Pavements	Calibration Factor, C_1	Regression equation	0.38	0.38	0.38	0.38
	Calibration Factor, C_2	Regression equation	1.66	1.66	1.66	1.66
	Calibration Factor, C_3	Regression equation	2.72	2.72	2.72	2.72
	Calibration Factor, C_4	Regression equation	105.4	105.4	105.4	105.4
	Calibration Factor, C_5	Regression equation	–7.02	–7.02	–7.02	–7.02
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, C_1	Regression equation	0.1	0.1	0.1	0.1
	Calibration Factor, C_2	Regression equation	0.9809	0.9809	0.9809	0.9809
	Calibration Factor, C_3	Regression equation	0.19	0.19	0.19	0.19
	Calibration Factor, C_4	Regression equation	165.3	165.3	165.3	165.3
	Calibration Factor, C_5	Regression equation	–5.1048	–5.1048	–5.1048	–5.1048
Fatigue Reflection Cracks of Semi-Rigid Pavements	Calibration Factor, C_1	Regression equation	1.64	1.64	1.64	1.64
	Calibration Factor, C_2	Regression equation	1.1	1.1	1.1	1.1
	Calibration Factor, C_3	Regression equation	0.19	0.19	0.19	0.19
	Calibration Factor, C_4	Regression equation	62.1	62.1	62.1	62.1
	Calibration Factor, C_5	Regression equation	–404.6	–404.6	–404.6	–404.6

Continued on next page.

© 2026 by the American Association of State Highway and Transportation Officials.
All rights reserved. Duplication is a violation of applicable law.

Table P-1. Summary of Key Differences in Software Format and Calibration Factors, *continued*

Format, Transfer Functions, and Calibration Coefficients		MEPDG version 1.1	AASHTOWare PMED version 2.3.1	AASHTOWare PMED version 2.5.3	AASHTOWare Pavement ME Design version 2.6	AASHTOWare Pavement ME Design version 3.0
International Roughness Index (IRI) Regression Equation, Asphalt Pavements and Asphalt Overlays of Flexible Pavements	Rut Depth, C_1	40.0	40.0	40.0	40.0	40.0
	Fatigue Cracking, C_2	0.400	0.400	0.400	0.400	0.400
	Transverse Cracking, C_3	0.0080	0.0080	0.0080	0.0080	0.0080
	Site Factor, C_4	0.0150	0.0150	0.0150	0.0150	0.015
IRI Regression Equation, Semi-Rigid Pavements, and Asphalt Overlays of Rigid Pavements	Rut Depth, *PCC*1	40.8	40.8	40.8	40.8	40.8
	Fatigue Cracking, *PCC*2	0.575	0.575	0.575	0.575	0.575
	Transverse Cracking, *PCC*3	0.0014	0.0014	0.0014	0.0014	0.0014
	Site Factor, *PCC*4	0.00825	0.00825	0.00825	0.00825	0.00825
IRI Regression Equation of JPCP	Cracking, C_1	0.8203	0.8203	0.8203	0.8203	0.446
	Spalling, C_2	0.4417	0.4417	0.4417	0.4417	0.373
	Faulting, C_3	1.4929	1.4929	1.4929	1.4929	0.993
	Site Factor, C_4	25.24	25.24	25.24	25.24	46.422

Continued on next page.

© 2026 by the American Association of State Highway and Transportation Officials.
All rights reserved. Duplication is a violation of applicable law.

Table P-1. Summary of Key Differences in Software Format and Calibration Factors, *continued*

Format, Transfer Functions, and Calibration Coefficients		MEPDG version 1.1	AASHTOWare PMED version 2.3.1	AASHTOWare PMED version 2.5.3	AASHTOWare Pavement ME Design version 2.6	AASHTOWare Pavement ME Design version 3.0
IRI Regression Equation of CRCP	Punchouts, C_3	3.15	3.15	3.15	3.15	3.15
	Site Factor, C_4	28.35	28.35	28.35	28.35	28.35

Note 1: β_{f1} for the adjustment to the laboratory-derived bending beam fatigue constant which is asphalt layer thickness dependent.

- Asphalt layer thickness less than 5 in.: $\beta_{f1} = 0.02054$.
- Asphalt layer thickness equal to or greater than 5 in. but less than or equal to 12 in.: $\beta_{f1} = 5.014(h_{ac})^{-3.416}$
- Asphalt layer thickness greater than 12 in.: $\beta_{f1} = 0.001032$.

Note 2: The adjustment to the calibration coefficient or field shift factor C_{f2} is asphalt layer thickness dependent.

- Asphalt layer thickness less than 5 in.: C_{f2} equals 2.1585.
- Asphalt layer thickness equal to or greater than 5 in. but less than or equal to 12 in.: $C_{f2} = 0.867+0.2583(h_{ac})$
- Asphalt layer thickness greater than 12 in.: $C_{f2} = 3.9666$

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

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

[a] NOAA. North American Regional Reanalysis (NARR). National Oceanic and Atmospheric Administration, Washington, DC. Available from https://www.ncei.noaa.gov/products/weather-climate-models/north-american-regional

[b] GMOA. Modern-Era Retrospective analysis for Research and Applications, Version 2. Global Modeling and Assimilation Office, National Aeronautics and Space Administration, Washington, DC. Available from https://gmao.gsfc.nasa.gov/gmao-products/merra-2/

© 2026 by the American Association of State Highway and Transportation Officials.
All rights reserved. Duplication is a violation of applicable law.

Table of Contents

Preface ..... **xi**
Table of Contents ..... **xxi**
List of Figures ..... **xxv**
List of Tables ..... **xxix**

1. Introduction **1-1**
1.1 Purpose of Manual 1-1
1.2 Overview of the Design Procedure 1-1

2. Referenced Documents and Standards **2-1**
2.1 Test Protocols and Standards 2-1
2.1.1 Laboratory Materials Characterization 2-1
2.1.2 In-Place Materials and Pavement Layer Characterization 2-3
2.2 Material Specifications 2-4
2.3 Recommended Practices and Terminology 2-4
2.4 Referenced Documents 2-4

3. Significance and Use of the AASHTO MEPDG **3-1**
3.1 AASHTO MEPDG Performance Indicators 3-1
3.2 Mechanistic–Empirical (ME) General Design Approach 3-2
3.3 New Flexible Pavement and Asphalt Concrete (AC) Overlay Design Strategies Applicable to the AASHTO MEPDG 3-4
3.4 New Rigid Pavement, PCC Overlay, and Restoration of Rigid Pavement Design Strategies Applicable for Use with the AASHTO MEPDG 3-10
3.5 Design Features and Factors Not Included within the ME Process 3-14

4. Terminology and Definition of Terms **4-1**
4.1 General Terms 4-1
4.2 Hierarchical Input Levels 4-3
4.3 Truck Traffic Terms 4-3
4.4 Smoothness 4-4
4.5 Distresses or Performance Indicators Terms—AC-Surfaced Pavements 4-5
4.6 Distress or Performance Indicators Terms—PCC-Surfaced Pavements 4-6

5. Performance Indicator Prediction Methodologies **5-1**
5.1 Selecting the Input Levels 5-1
5.2 Calibration Factors 5-3
5.3 Distress Prediction Equations for Flexible Pavements and AC Overlays 5-4
5.3.1 Overview of Computational Methodology for Predicting Distress 5-4
5.3.2 Rut Depth 5-5
5.3.3 Load-Related Cracking 5-9
5.3.4 Non-Load-Related Cracking—Transverse Cracking 5-19

© 2026 by the American Association of State Highway and Transportation Officials.
All rights reserved. Duplication is a violation of applicable law.

5.3.5 Reflection Cracking in AC Overlays and AC Layers of Semi-Rigid Pavements . . . 5-23
5.3.6 Smoothness . . . 5-29
5.4 Distress Prediction Equations for Rigid Pavements and PCC Overlays . . . 5-32
5.4.1 Transverse Slab Cracking (Bottom-Up and Top-Down)—JPCP . . . 5-32
5.4.2 Mean Transverse Joint Faulting—JPCP . . . 5-35
5.4.3 CRCP Punchouts . . . 5-43
5.4.4 Longitudinal Slab Cracking—SJPCP on Flexible Pavements . . . 5-47
5.4.5 Smoothness—JPCP . . . 5-51
5.4.6 Smoothness—CRCP . . . 5-53

6. General Project Information . . . 6-1
6.1 Design Life . . . 6-1
6.2 Construction and Traffic Opening Dates . . . 6-1

7. Selecting Design Criteria and Reliability Level . . . 7-1
7.1 Recommended Design-Performance Criteria . . . 7-1
7.2 Reliability . . . 7-3
7.3 Design Reliability Concept for Smoothness (IRI) . . . 7-4

8. Determining Site Conditions and Factors . . . 8-1
8.1 Truck Traffic . . . 8-1
8.1.1 Roadway-Specific Inputs . . . 8-3
8.1.2 Inputs Extracted from WIM Data . . . 8-4
8.1.3 Truck Traffic Inputs Not Included in the WIM Data . . . 8-10
8.2 Climate . . . 8-13
8.3 Foundation and Subgrade Soils . . . 8-14
8.3.1 Subsurface Investigations for Pavement Design . . . 8-14
8.3.2 Laboratory and Field Tests of Soils for Pavement Design . . . 8-15
8.4 Existing Pavements . . . 8-16

9. Pavement Evaluation for Rehabilitation Design . . . 9-1
9.1 Overall Condition Assessment and Problem Definition Categories . . . 9-1
9.2 Data Collection to Define Condition Assessment . . . 9-4
9.2.1 Initial Pavement Assessment . . . 9-9
9.2.2 Prepare Field Evaluation Plan . . . 9-10
9.2.3 Conduct Condition or Visual Survey . . . 9-10
9.2.4 Ground Penetrating Radar (GPR) Survey . . . 9-15
9.2.5 Refine Field Testing Plan . . . 9-15
9.2.6 Conduct Deflection Basin Tests . . . 9-15
9.2.7 Destructive Sampling and Testing—Recover Cores and Boring for the Existing Pavement . . . 9-17
9.2.8 Laboratory Tests for Materials Characterization of Existing Pavements . . . 9-21
9.3 Analysis of Pavement Evaluation Data for Rehabilitation Design Considerations . . . 9-23

© 2026 by the American Association of State Highway and Transportation Officials.
All rights reserved. Duplication is a violation of applicable law.

9.3.1 Visual Distress Survey to Define Structural Adequacy 9-23
9.3.2 Backcalculation of Layer Modulus Values 9-25
9.3.3 Loss of Support Detection 9-27
9.3.4 Joint or Crack Load Transfer Efficiency 9-27
9.3.5 Variability along a Project 9-29

10. Determination of Material Properties for New Paving Materials 10-1
10.1 Material Inputs and the Hierarchical Input Concept 10-1
10.2 Asphalt Concrete (AC) Mixtures, Including Stone Matrix Asphalt (SMA), Asphalt Treated or Stabilized Base Layers, and Asphalt Permeable Treated Base Mixes 10-1
10.3 Portland Cement Concrete (PCC) Mixtures, Lean Concrete, and Cement Treated Base Layers 10-13
10.4 Chemically Stabilized Materials, Including Lean Concrete and Cement Treated Base Layers 10-14
10.5 Unbound Aggregate Base Materials and Engineered Embankments 10-22

11. Pavement Design Strategies 11-1
11.1 New Flexible Pavement Design Strategies—Developing the Initial Trial Design . . . 11-1
11.1.1 Should the Subgrade Soil be Strengthened or Improved? 11-2
11.1.2 Is a Rigid Layer or Water Table Present? 11-4
11.1.3 Is a Compacted Embankment or Improved Subgrade Layer Present? 11-4
11.1.4 Should a Drainage Layer Be Included in the Design Strategy? 11-5
11.1.5 Use of a Stabilized Subgrade for Structural Design or a Construction Platform? 11-5
11.1.6 Should an Aggregate Base or Subbase Layer Be Placed? 11-6
11.1.7 AC Layers—What Type and How Many? 11-6
11.1.8 What Initial International Roughness Index (IRI) Value Should Be Used? 11-7
11.1.9 Pavement Structure for Top-Down Cracking Prediction 11-8
11.2 New Rigid Pavement Design Strategies—Developing the Initial Trial Design 11-8
11.2.1 Structure—Trial Layer Type, Thickness, and Design Features 11-8
11.2.2 Jointed Plain Concrete Pavement (JPCP) Design 11-10
11.2.3 Continuously Reinforced Concrete Pavement (CRCP) Design 11-12
11.2.4 Initial Surface Smoothness 11-14
11.2.5 Narrow or Widened Slabs 11-14

12. Rehabilitation Design Strategies 12-1
12.1 General Overview of Rehabilitation Design 12-1
12.2 Rehabilitation Design with AC Overlays 12-3
12.2.1 Overview 12-3
12.2.2 AC Overlay Analyses and Trial Rehabilitation Design 12-3
12.2.3 Determine Condition of Existing Pavement 12-4
12.2.4 Decide on Pre-Overlay Treatment 12-5

© 2026 by the American Association of State Highway and Transportation Officials.
All rights reserved. Duplication is a violation of applicable law.

12.2.5 Determination of Damaged Modulus of Bound Layers and Reduced Interface Friction . . . 12-9
12.2.6 AC Overlay Options of Existing Pavements . . . 12-10
12.2.7 AC Overlays of Existing AC Pavements, Including Semi-Rigid Pavements . . . 12-11
12.2.8 AC Overlays of Existing Intact PCC Pavements, Including Composite Pavements (One or More AC overlays of Existing JPCP and CRCP) . . . 12-12
12.2.9 AC Overlay of Fractured PCC Pavements . . . 12-16
12.3 Rehabilitation Design with PCC Overlays . . . 12-23
12.3.1 Overview . . . 12-23
12.3.2 Analysis Parameters Unique to Rehabilitation . . . 12-25
12.3.3 Estimate of Past Damage (for JPCP Subjected to *Concrete Pavement Restoration* [CPR]) . . . 12-26
12.3.4 JPCP Rehabilitation Design . . . 12-30
12.3.5 CRCP Rehabilitation Design . . . 12-39
12.3.6 Additional Considerations for Rehabilitation with PCC . . . 12-43

13. Interpretation and Analysis of the Trial Design . . . 13-1
13.1 Summary of Inputs for the Trial Design . . . 13-1
13.2 Reliability of Trial Design . . . 13-1
13.3 Supplemental Information (Layer Modulus, Truck Applications, and Other Factors) . . . 13-2
13.4 Predicted Performance Values . . . 13-4
13.5 Judging the Acceptability of the Trial Design . . . 13-6

14. Abbreviations and Terms . . . 14-1

A. Creep Compliance Calculated from Dynamic Modulus Data for Input Level 2 . . . A-1
A.1 Introduction . . . A-1
A.2 Viscoelastic Material and Creep Compliance . . . A-1
A.3 Converting from Dynamic Modulus to Creep Compliance . . . A-2
A.4 References . . . A-8

B. Relationship between Strength and Elastic Modulusof Chemically Stabilized Layers for Semi-Rigid Pavement Design . . . B-1
B.1 Introduction . . . B-1
B.2 Elastic Modulus vs. Modulus of Rupture (MOR) . . . B-2
B.3 Strength vs. Elastic Modulus: Resistance to Fatigue Cracking—Determining if Thinner or Thicker Layers Should be Used . . . B-4

C. Relationship between PCC Strength and Elastic Modulus . . . C-1
C.1 Introduction . . . C-1
C.2 Determining if Measured or Calculated PCC Elastic Modulus Can Be Used Interchangeably . . . C-2

© 2026 by the American Association of State Highway and Transportation Officials.
All rights reserved. Duplication is a violation of applicable law.

C.3 Strength vs. Elastic Modulus: Resistance to Fatigue Cracking—Determining if Thinner or Thicker PCC Slabs Should be Used. C-4
C.4 References C-6

© 2026 by the American Association of State Highway and Transportation Officials.
All rights reserved. Duplication is a violation of applicable law.

This page intentionally left blank.

© 2026 by the American Association of State Highway and Transportation Officials.
All rights reserved. Duplication is a violation of applicable law.

List of Figures

Figure 1-1. Conceptual Flow Chart of the Three-Stage Design and Analysis Process for PMED 1-3

Figure 1-2. Typical Differences between Empirical Design Procedures and an Integrated ME Design System, in Terms of AC Mixture Characterization 1-4

Figure 1-3. Typical Differences between Empirical Design Procedures and an Integrated ME Design System, in Terms of PCC-Mixture Characterization. 1-5

Figure 1-4. Flow Chart of Policy Decision-Related Steps to Complete an Analysis of a Trial Design Strategy 1-7

Figure 1-5. Flow Chart of the Steps Needed to Complete an Analysis of a Trial Design Strategy 1-8

Figure 3-1. New (Including Lane Reconstruction) Flexible Pavement Design Strategies That Can Be Simulated with PMED (Section 11.1); Layer Thickness Not to Scale 3-5

Figure 3-2. AC Overlay Design Strategies of Flexible, Semi-Rigid, and Rigid Pavements That Can Be Simulated with PMED (Section 12.2); Layer Thickness Not to Scale 3-6

Figure 3-3. New (Including Lane Reconstruction) Rigid Pavement Design Strategies That Can Be Simulated with PMED (Refer to Section 11.2); Layer Thickness Not to Scale 3-12

Figure 3-4. PCC Overlay Design Strategies of Flexible, Semi-Rigid, and Rigid Pavements That Can Be Simulated with PMED (Refer to Section 12.3); Layer Thickness Not to Scale 3-13

Figure 5-1. Graphical Illustration of the Five Temperature Quintiles Used in the AASHTO MEPDG to Determine Asphalt Concrete (AC) Mixture Properties for Load-Related Distresses. 5-5

Figure 5-2. Comparison of Measured and Predicted Total Rutting Resulting from Global Calibration Process 5-9

Figure 5-3. Comparison of Cumulative Fatigue Damage and Alligator Cracking Resulting from Global Calibration Process 5-12

Figure 5-4. Mechanisms of Thermally Induced Reflective Cracks of Asphalt Overlays. 5-13

Figure 5-5a. Measured vs. Predicted Number of Days to Crack Initiation 5-16

Figure 5-5b. Measured vs. Predicted Area of Top-Down Cracking 5-17

Figure 5-6. Comparison of Measured and Predicted Transverse Cracking Resulting from Global Calibration Process 5-21

Figure 5-7. Response Mechanisms Used in Reflection Cracking Prediction Methodology. 5-23

© 2026 by the American Association of State Highway and Transportation Officials.
All rights reserved. Duplication is a violation of applicable law.

Figure 5-8. Mechanisms of Thermally Induced Reflective Cracks of AC Overlays 5-24

Figure 5-9. Mechanisms of Traffic Induced Reflective Cracks of AC Overlays 5-24

Figure 5-10. Comparison of Measured and Predicted International Roughness Index (IRI) Values Resulting from Global Calibration Process of Flexible Pavements and AC Overlays of Flexible Pavements 5-31

Figure 5-11. Comparison of Measured and Predicted IRI Values Resulting from Global Calibration Process of AC Overlays of PCC Pavements and Semi-Rigid Pavements 5-31

Figure 5-12. Comparison of Measured and Predicted Percentage JPCP Slabs Cracked Resulting from Global Calibration 5-35

Figure 5-13. Comparison of Measured and Predicted Transverse Joint Faulting for New JPCP Resulting from Global Calibration Process 5-42

Figure 5-14a. Comparison of Measured and Predicted Punchouts for New CRCP Resulting from Global Calibration Process 5-46

Figure 5-14b. Comparison of Measured Punchouts and Predicted Fatigue Damage for New CRCP Resulting from Global Calibration Process 5-47

Figure 5-15. Illustration of Proper Location of Longitudinal Joints to Avoid Overlap with Truck Wheel Paths (to Avoid Corner Cracking) and the Resulting Critical Bending Stresses at Bottom of Slab That Are Considered to Limit Longitudinal Fatigue Cracking 5-48

Figure 5-16. Measured Longitudinal Fatigue Cracking (LCRK) versus PCC Fatigue Damage (DI_F) at Bottom of PCC Slab 5-50

Figure 5-17. Comparison of Measured and Predicted Percentage SJPCP Overlay Slabs Longitudinally Cracked Resulting from Global Calibration Process 5-50

Figure 5-18. Comparison of Measured and Predicted IRI Values for New JPCP Resulting from Global Calibration Process 5-53

Figure 5-19. Comparison of Measured and Predicted IRI Values for New CRCP Resulting from Global Calibration Process 5-55

Figure 7-1. Design Reliability Concept for Smoothness (IRI) 7-4

Figure 8-1. Comparison of the Five NALS Defaults for Vehicle Class 9 Tandem Axles—Entire Range of Axle Loads 8-6

Figure 8-2. Comparison of the Five NALS Defaults for Vehicle Class 9 Tandem Axles—Axle Loads between 32,000–50,000 lb 8-7

Figure 9-1. Steps and Activities for Assessing Condition of Existing Pavements for Rehabilitation Design (Refer to Table 9-2) 9-5

Figure 9-2. Location of the Loading Plate and Sensor Relative to the Joint or Transverse Crack for Measuring Load Transfer Efficiency (LTE) 9-17

© 2026 by the American Association of State Highway and Transportation Officials.
All rights reserved. Duplication is a violation of applicable law.

Figure 9-3. Schematic of the LTE for Two Cases 9-28
Figure 11-1. Flow Chart to Select Some Options and Minimize the Effect of Problem Soils on Pavement Performance 11-3
Figure 11-2. Limiting Modulus Criteria of Unbound Aggregate Base and Subbase Layers 11-7
Figure 12-1. Steps for Determining a Preferred Rehabilitation Strategy 12-2
Figure 12-2. Flow Chart of Rehabilitation Design Options Using AC Overlays 12-4
Figure 12-3. Site Features Conducive to the Selection of the Rubblization Process for Rehabilitating PCC Pavements 12-19
Figure 12-4. Recommendations for a Detailed Investigation of the PCC Pavement to Estimate Remaining Life and Identify Site Features and Conditions Conducive to the Rubblization Process 12-20
Figure 12-5. Evaluate Surface Condition and Distress Severities on Selection of Rubblization Option 12-21
Figure 12-6. Foundation Support Conditions Related to the Selection of the Rubblization Process 12-22
Figure 12-7. Overall Design Process for Major PCC Rehabilitation Strategies of All Pavement Types 12-25
Figure A-1. Dynamic Modulus Curves from Original Sigmoidal Function and Prony Series with Coefficients Determined from LLS A-6
Figure A-2. Dynamic Modulus Curves from Original Sigmoidal Function and Prony Series with Coefficients Determined after NLS A-7
Figure A-3. Relaxation Modulus Curves from Original Sigmoidal Function and Prony Series with Coefficients Determined after NLS A-7
Figure B-1. Chemically Stabilized Layers as Defined in the AASHTOWare Pavement ME Design (PMED) Software B-1
Figure B-2. AASHTO MEPDG Relationships between the Compressive Strength and Elastic Modulus for Different Chemically Stabilized Materials B-3
Figure B-3. Relationships between the Modulus of Rupture (MOR) and Elastic Modulus for Different Chemically Stabilized Materials B-4
Figure B-4. PMED Theoretical Relationship between Flexural Strength and Elastic Modulus for Equal Fatigue Cracking of the Chemically Stabilized Material B-5
Figure B-5. Relationship between MOR and Elastic Modulus for different Chemically Stabilized Materials with the Same Amount of Fatigue Cracking Predicted B-6
Figure C-1. Correspondence between the Modulus of Rupture (MOR) and Elastic Modulus Data Extracted from the LTPP Database for some SPS-2 Rigid Pavement Test Sections Included in the LTPP Program. C-2

© 2026 by the American Association of State Highway and Transportation Officials.
All rights reserved. Duplication is a violation of applicable law.

Figure C-2. MOR and Elastic Modulus Data in Comparison to the PMED Regression Equations between MOR and Elastic Modulus C-4

Figure C-3. PMED Theoretical Relationship between MOR and Elastic Modulus for Equal Percentage of Cracked Slabs at the End of the Design Life C-5

© 2026 by the American Association of State Highway and Transportation Officials.
All rights reserved. Duplication is a violation of applicable law.

List of Tables

Table P-1. Summary of Key Differences in Software Format and Calibration Factors xii
Table 5-1. Typical Input Levels Used in the Global Calibration of PMED Models and Transfer Functions 5-2
Table 5-2. Calibration Parameters α_1 and α_2: Global Coefficients 5-17
Table 5-3. Calibration Parameters for Crack Initiation Time, t_0: Global Coefficients 5-18
Table 5-4. Global Calibration Coefficients for the Reflection Cracking Transfer Functions for Transverse Cracks 5-27
Table 5-5. Global Calibration Coefficients for the Reflection Cracking Transfer Functions for Fatigue Cracks 5-28
Table 5-6. Standard Deviation Equations for the Transverse Cracks 5-29
Table 5-7. Standard Deviation Equations for the Fatigue Cracks 5-29
Table 5-8. Assumed Effective Base LTE for Different Base Types 5-38
Table 7-1. Design Criteria or Threshold Values Recommended for Use in Judging the Acceptability of a Trial Design 7-2
Table 7-2. Suggested Minimum Levels of Reliability for Different Functional Classifications of the Roadway. 7-5
Table 8-1. Minimum Sample Size (Number of Days per Year) to Estimate the Normalized Axle Load Distribution—WIM Data. 8-2
Table 8-2. Minimum Sample Size (Number of Days per Season) to Estimate the Normalized Truck Traffic Distribution—Automated Vehicle Classifier (AVC) Data 8-2
Table 8-3. Normalized Axle Load Distribution Included with PMED 8-5
Table 8-4. TTC Group Description and Corresponding Truck Class Distribution Default Values Included in PMED 8-8
Table 8-5. Definitions and Descriptions for the TTC Groups 8-10
Table 8-6. Typical Characteristics for Axle Types 8-11
Table 8-7. Axle Load Groups for Single and Dual Tires 8-12
Table 8-8. Summary of Soil Characteristics as a Pavement Material 8-16
Table 9-1. Checklist of Factors for Overall Pavement Condition Assessment and Problem Definition 9-3
Table 9-2. Hierarchical Input Levels for a Pavement Evaluation Program to Determine Inputs for Existing Pavement Layers for Rehabilitation Design 9-6

© 2026 by the American Association of State Highway and Transportation Officials.
All rights reserved. Duplication is a violation of applicable law.

Table 9-3. Field Data Collection and Evaluation Plan 9-11
Table 9-4. Guidelines for Obtaining Non-Materials Input Data for Pavement Rehabilitation 9-12
Table 9-5. Use of Deflection Basin Test Results for Selecting Rehabilitation Strategies and in Estimating Inputs for Rehabilitation Design 9-16
Table 9-6. Summary of Destructive Tests, Procedures, and Inputs for PMED 9-18
Table 9-7. Models or Relationships Used for Determining Level 2 E or M_r 9-19
Table 9-8. Models Relating Material Index and Strength Properties to M_r 9-19
Table 9-9. Distress Types and Severity Levels Recommended for Assessing Rigid Pavement Structural Adequacy 9-24
Table 9-10. Distress Types and Levels Recommended for Assessing Current Flexible Pavement Structural Adequacy 9-24
Table 9-11. LTE Values for Rehabilitation Design 9-28
Table 9-12. LTE Default Values for Input Level 3 Tied to Crack Severity Level 9-29
Table 10-1. Major Material Types for PMED 10-2
Table 10-2. Asphalt Materials and the Test Protocols for Measuring the Material Property Inputs for New and Existing AC Layers, Input Level 1 10-3
Table 10-3. Recommended Input Parameters and Values; Limited or No Testing Capabilities for AC (Input Levels 2 or 3) 10-9
Table 10-4. PCC Material Input Level 1 Parameters and Test Protocols for New and Existing PCC 10-14
Table 10-5. Recommended PCC Material Input Levels 2 and 3 Parameters for New and Existing PCC 10-16
Table 10-6. Chemically Stabilized Materials Input Level 1 Requirements and Test Protocols for New and Existing Chemically Stabilized Materials 10-19
Table 10-7. Recommended Input Levels 2 and 3 Parameters and Values for Chemically Stabilized Material Properties 10-21
Table 10-8. C-Values to Convert the Calculated Layer Modulus Values to an Equivalent Resilient Modulus Measured in the Laboratory 10-22
Table 10-9. Unbound Aggregate Base, Subbase, Embankment, and Subgrade Soil Input Level 1 Material Requirements and Test Protocols for New and Existing Materials . . . 10-23
Table 10-10. Recommended Levels 2 and 3 Input Parameters and Values for Unbound Aggregate Base, Subbase, Embankment, and Subgrade Soil Material Properties 10-25
Table 11-1. General IRI Recommendations 11-8
Table 11-2. Friction Coefficient Values for CRCP Design 11-13

© 2026 by the American Association of State Highway and Transportation Officials.
All rights reserved. Duplication is a violation of applicable law.

Table 12-1. Definitions of Surface Condition for Input Level 3 Pavement Condition Ratings and Suggested Rehabilitation Options 12-6

Table 12-2. Candidate Repair and Preventive Treatments for Flexible, Rigid, and Composite Pavements. 12-7

Table 12-3. Summary of Major Rehabilitation Strategies and Treatments Prior to Overlay Placement for Existing AC and AC Over PCC Pavements 12-8

Table 12-4. Data Required for Characterizing Existing PCC Slab Static Elastic Modulus for AC Overlay Design 12-15

Table 12-5. Recommendations for Performance Criteria for AC Overlays of JPCP and CRCP 12-16

Table 12-6. Recommendations for Modifying Trial Design to Reduce Distress, Roughness, or Both for AC Overlays of JPCP and CRCP. 12-17

Table 12-7. PCC Rehabilitation Options—Strategies to Correct Surface and Structural Deficiencies of All Types of Existing Pavement 12-24

Table 12-8. Summary of Key Aspects of Joint Design and Interlayer Friction for JPCP Overlays. 12-27

Table 12-9. Data Required for Characterizing the Existing PCC Slab 12-29

Table 12-10. Description of Existing Pavement Condition 12-29

Table 12-11. Summary of Factors that Influence Rehabilitated JPCP Distress 12-32

Table 12-12. Guidance on How to Select the Appropriate Design Features for Rehabilitated JPCP Design 12-35

Table 12-13. Recommendations for Modifying Trial Design to Reduce Distress, Roughness, or Both for JPCP Rehabilitation Design 12-37

Table 12-14. Summary of Factors that Influence Rehabilitated CRCP Distress and Smoothness 12-40

Table 12-15. Guidance on How to Select the Appropriate Design Features for Rehabilitated CRCP Design. 12-42

Table 13-1. Reliability Summary for Flexible Pavement Trial Design Example 13-2

Table 13-2. Reliability Summary for JPCP Trial Design Example 13-2

Table 13-3. Guidance for Modifying AC Trial Designs to Satisfy Performance Criteria 13-7

Table 13-4. Guidance for Modifying JPCP Trial Designs to Satisfy Performance Criteria 13-9

Table 13-5. Guidance for Modifying CRCP Trial Designs to Satisfy Performance Criteria. . . 13-10

© 2026 by the American Association of State Highway and Transportation Officials.
All rights reserved. Duplication is a violation of applicable law.

This page intentionally left blank.

© 2026 by the American Association of State Highway and Transportation Officials.
All rights reserved. Duplication is a violation of applicable law.

CHAPTER 1



Introduction

The overall objective of the *Mechanistic–Empirical Pavement Design Guide: A Manual of Practice* (AASHTO MEPDG) is to provide the highway community with a state-of-the-practice method for the design and analysis of new and rehabilitated pavement structures, based on mechanistic–empirical (ME) principles. This means that the design and analysis procedure calculates pavement responses (stresses, strains, and deflections) and uses those responses to compute incremental damage over time. The procedure empirically relates the cumulative damage to observed pavement distresses. The flowchart in Figure 1-1 illustrates this ME-based procedure. AASHTOWare Pavement ME Design is the commercially available software tool. The AASHTOWare software is referred to in this manual as PMED.

PMED represents a major change in the way pavement design is performed. PMED predicts multiple performance indicators (see Figure 1-1), and it provides a direct tie between materials, structural design, construction, climate, traffic, and pavement management systems. Figures 1-2 and 1-3 are examples of the interrelationship between these activities for asphalt concrete (AC) and portland cement concrete (PCC) materials.

1.1 Purpose of Manual

This Manual presents information to guide pavement design engineers in making decisions and using PMED for new pavement and rehabilitation design. The Manual does not provide guidance on developing regional or local calibration factors for predicting pavement distress and smoothness. The PMED includes an updated local calibration guide, which replaces a standalone publication, *Guide for Local Calibration of the Mechanistic-Empirical Design Guide* (AASHTO, 2010; archived).

1.2 Overview of the Design Procedure

PMED is a production-ready design tool to support the day-to-day operations of public and private pavement engineers. When analyzing a pavement design project using PMED, whether it is new construction, an overlay, or restoration, utilize the following three-step, basic process:

1. Create a trial design for the project.

© 2026 by the American Association of State Highway and Transportation Officials.
All rights reserved. Duplication is a violation of applicable law.

2. Run PMED to predict the key distresses and smoothness for the trial design.
3. Review the predicted performance of the trial design against performance criteria, then modify the trial design as needed in order to produce a feasible design that satisfies the performance criteria at the selected reliability level.

Pavement responses (stresses, strains, and deflections) are combined with other pavement, traffic, climate, and materials parameters to predict the progression of key pavement distresses and smoothness loss over time. These outputs are the basis for checking the adequacy of a trial design. PMED software also includes an automated process or feature to iterate to an optimized pavement thickness for both flexible and rigid pavements.

© 2026 by the American Association of State Highway and Transportation Officials.
All rights reserved. Duplication is a violation of applicable law.

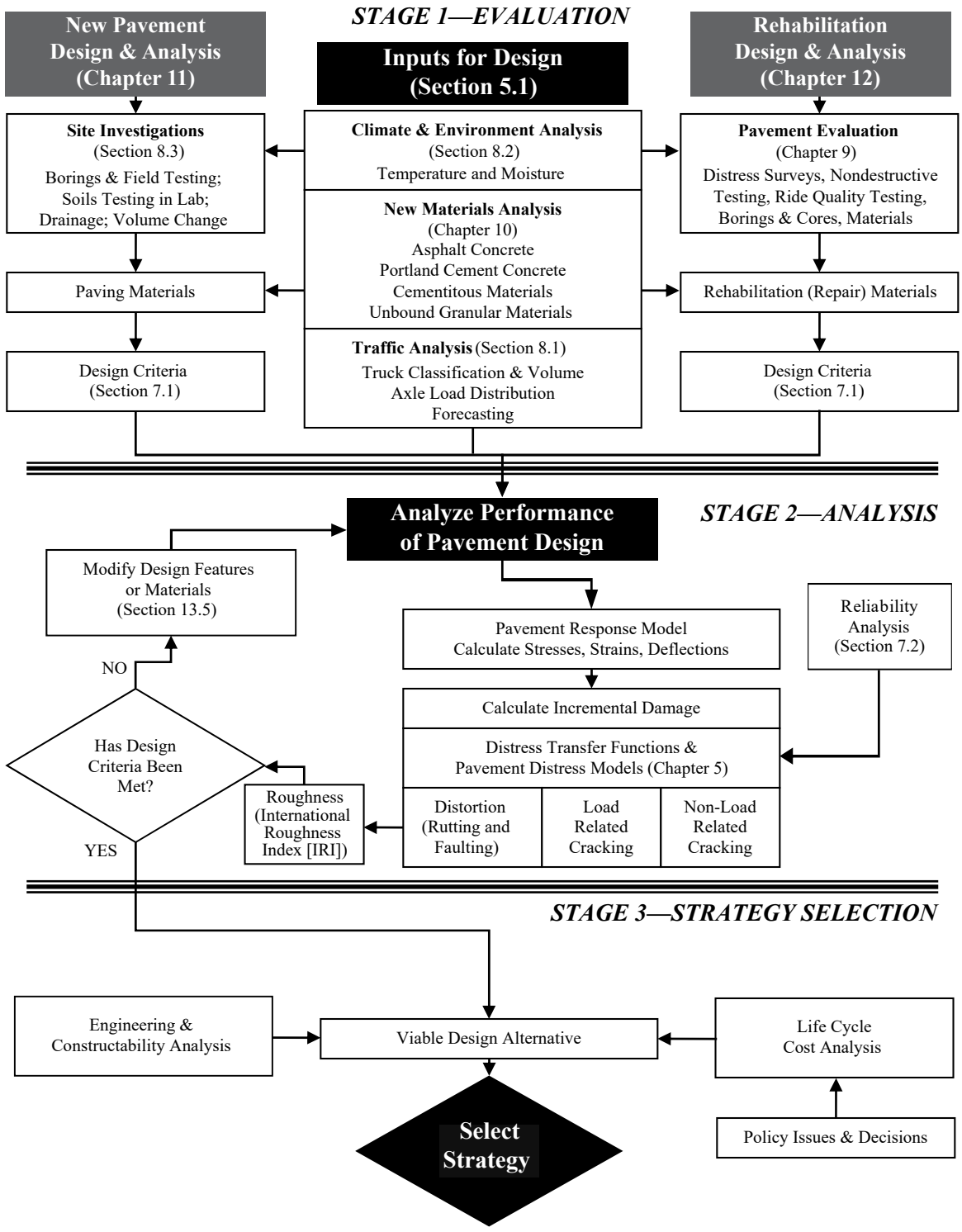


Figure 1-1. Conceptual Flow Chart of the Three-Stage Design and Analysis Process for PMED

© 2026 by the American Association of State Highway and Transportation Officials.
All rights reserved. Duplication is a violation of applicable law.

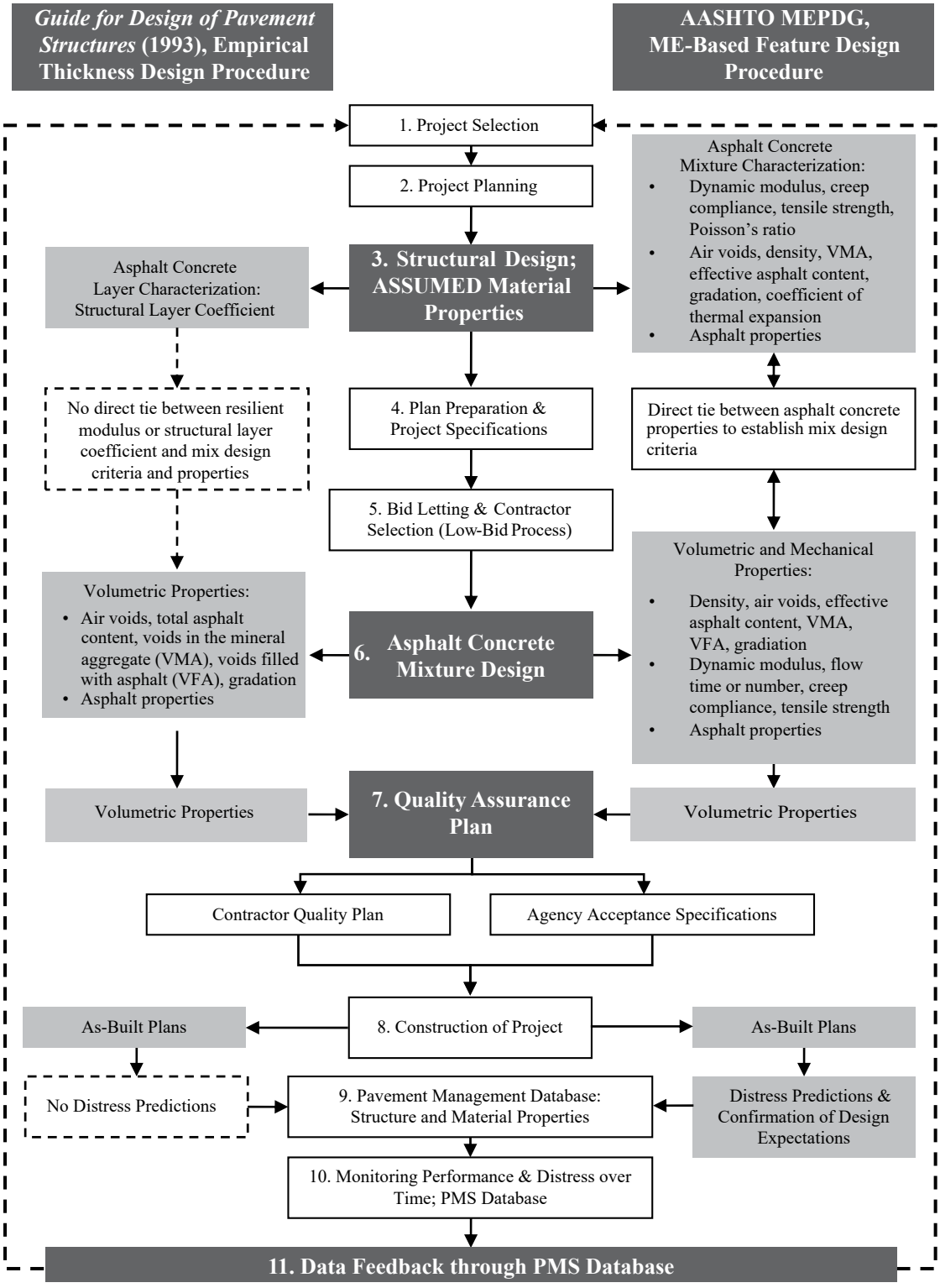


Figure 1-2. Typical Differences between Empirical Design Procedures and an Integrated ME Design System, in Terms of AC Mixture Characterization

© 2026 by the American Association of State Highway and Transportation Officials.
All rights reserved. Duplication is a violation of applicable law.

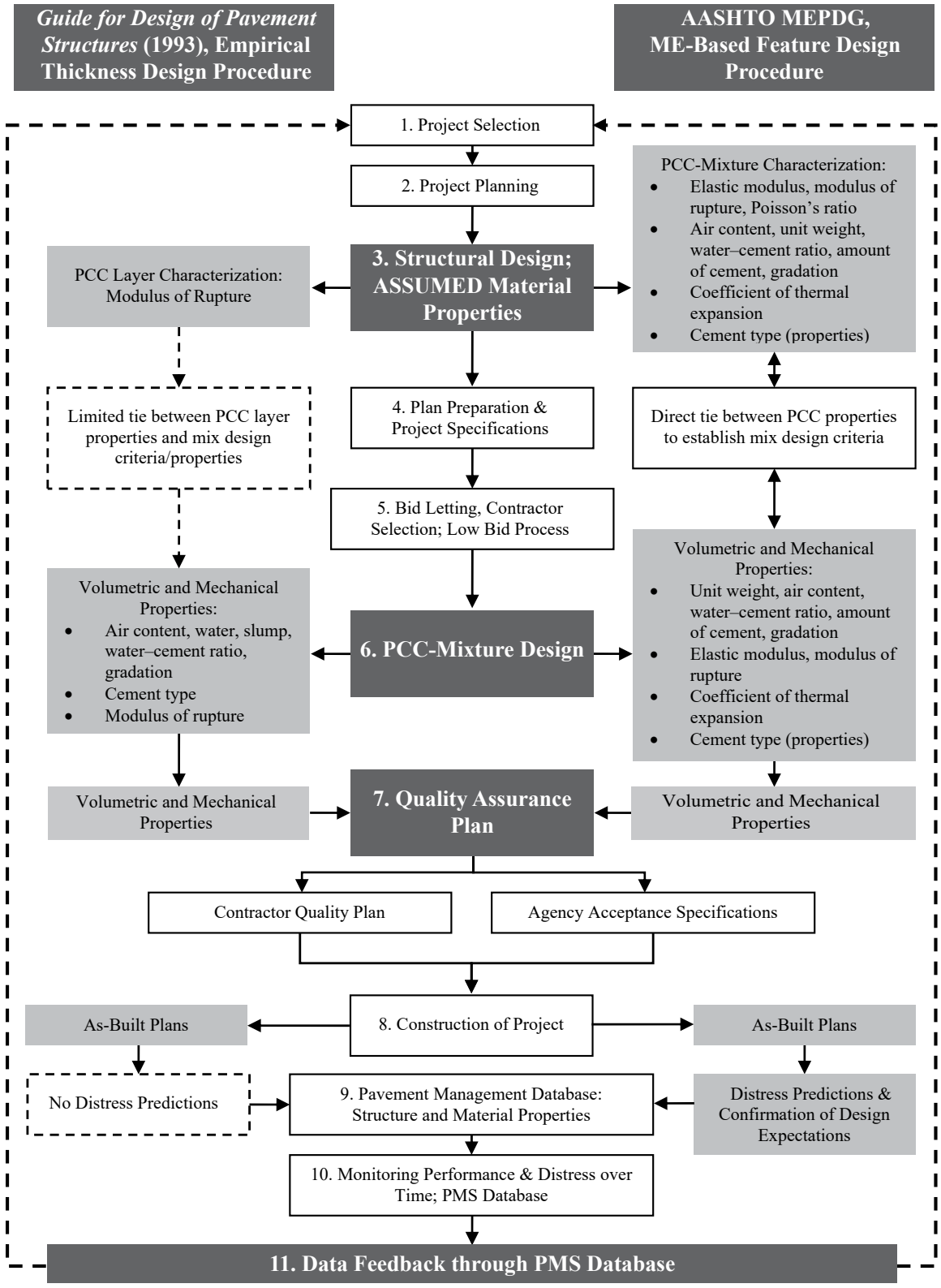


Figure 1-3. Typical Differences between Empirical Design Procedures and an Integrated ME Design System, in Terms of PCC-Mixture Characterization

© 2026 by the American Association of State Highway and Transportation Officials.
All rights reserved. Duplication is a violation of applicable law.

The ME approach makes it possible to optimize the design and to fully verify that specific distress types will be limited to values less than the failure criteria within the design life of the pavement structure. The basic steps included in the AASHTO MEPDG are listed below and presented as flow charts in Figures 1-4 and 1-5. The steps shown in Figures 1-4 and 1-5 reference the appropriate sections of this Manual.

1. **Select a trial design strategy.** The pavement designer may use an agency-specific procedure to determine the trial design cross section.
2. **Select the appropriate performance indicator criteria (threshold value) and design reliability level for the project.** Design or performance indicator criteria include magnitudes of key pavement distresses and smoothness that may trigger major rehabilitation or reconstruction. These criteria could be a part of an agency's policies for deciding when to rehabilitate or reconstruct. PMED allows the user to select the performance indicator criteria to be considered. The user can uncheck the box next to the criteria that do not need to be considered. (See Section 4.1 for definitions.)
3. **Obtain all inputs for the pavement trial design under consideration.** This step may be a time-consuming effort, but it is what separates the ME from other design procedures. PMED allows the designer to determine inputs using a hierarchical structure in which the effort to quantify a given input is selected based on the importance of the project, importance of the input, and available resources. The required inputs to run the software are obtained using one of three levels of effort that need not be consistent for all of the inputs for a given design. This permits the user to use the "best available" data for all inputs. The hierarchical input levels are defined in Section 4.2, and are grouped under six broad topics: (1) general project information, (2) design criteria, (3) traffic, (4) climate, (5) structure layering, and (6) material properties (including the design features). *A caution to the designer: Some of the input parameters are interrelated; changing one parameter may affect the value of another input parameter. The designer should use caution in making changes in individual parameters.*
4. **Run PMED and examine the inputs and outputs for engineering reasonableness.** The software calculates changes in layer properties, damage, key distresses, and the International Roughness Index (IRI) over the design life. The substeps for Step 4 are
    a. Examine the input summary to verify the inputs are correct. This step should be completed after each run, until the designer becomes more familiar with the program and its inputs.
    b. Examine the outputs that comprise the intermediate process, such as climate values, monthly load transfer efficiency (LTE) values for rigid pavement analysis, and monthly layer modulus values for flexible and rigid pavement analysis, to determine their reasonableness. Also examine the calculated performance indicators (pavement distresses and IRI). This step may be completed after each

© 2026 by the American Association of State Highway and Transportation Officials.
All rights reserved. Duplication is a violation of applicable law.

run or until the designer becomes more familiar with the program. Review of important intermediate processes and steps is presented in Section 13.3.

c. Assess whether the trial design has met each of the performance indicator criteria at the design reliability level chosen for the project. As noted above, IRI is an output parameter predicted over time and a measure of surface smoothness. IRI is calculated from other distress predictions (refer to Figure 1-1), site factors, and initial IRI.

d. If any of the criteria are not met, determine how this deficiency can be remedied by altering the materials used, the layering of materials, layer thickness, or other design features.

5. **Revise the trial design, as needed.** If the trial design has input errors, material output anomalies, or has exceeded the failure criteria at the given level of reliability, revise the inputs in the trial design and rerun the program. An automated process to iterate to an optimized thickness is done by PMED to produce a feasible design.

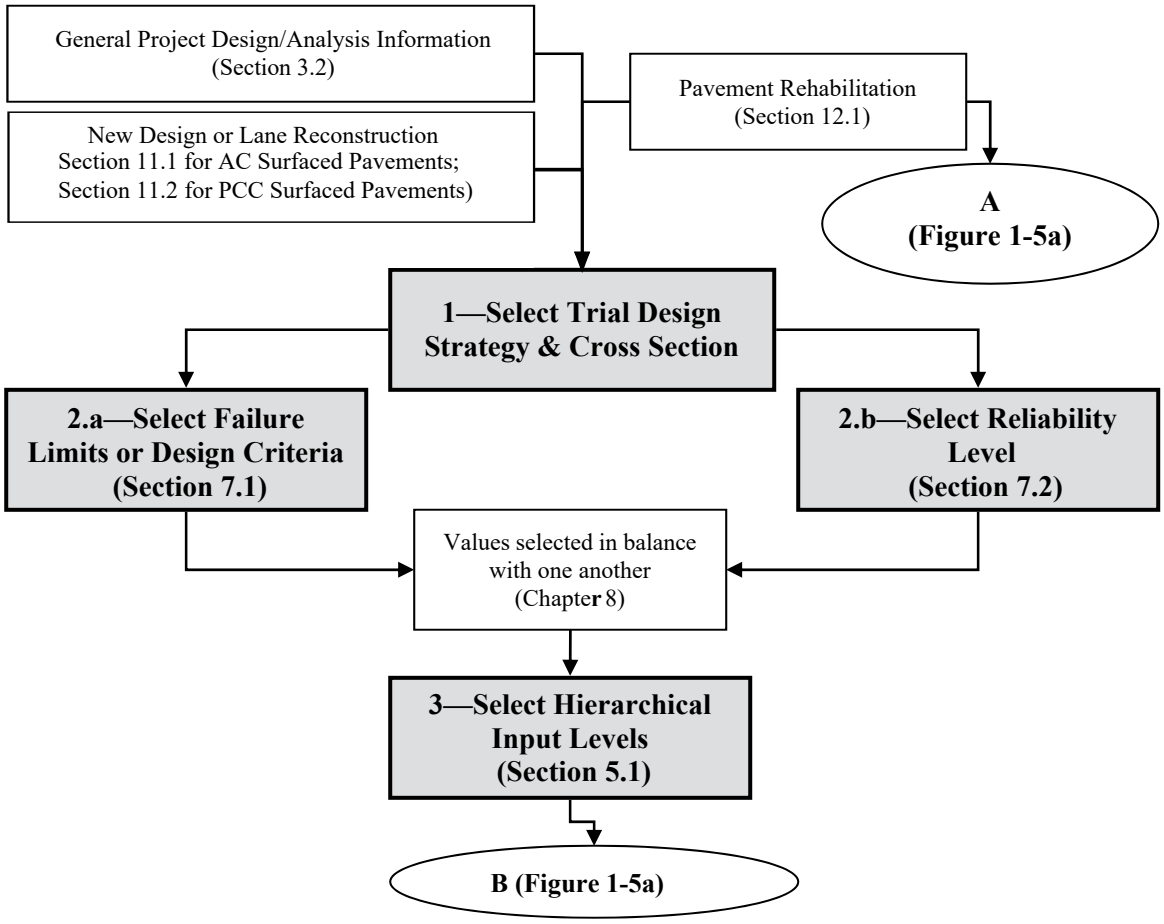


Figure 1-4. Flow Chart of Policy Decision-Related Steps to Complete an Analysis of a Trial Design Strategy

© 2026 by the American Association of State Highway and Transportation Officials.
All rights reserved. Duplication is a violation of applicable law.

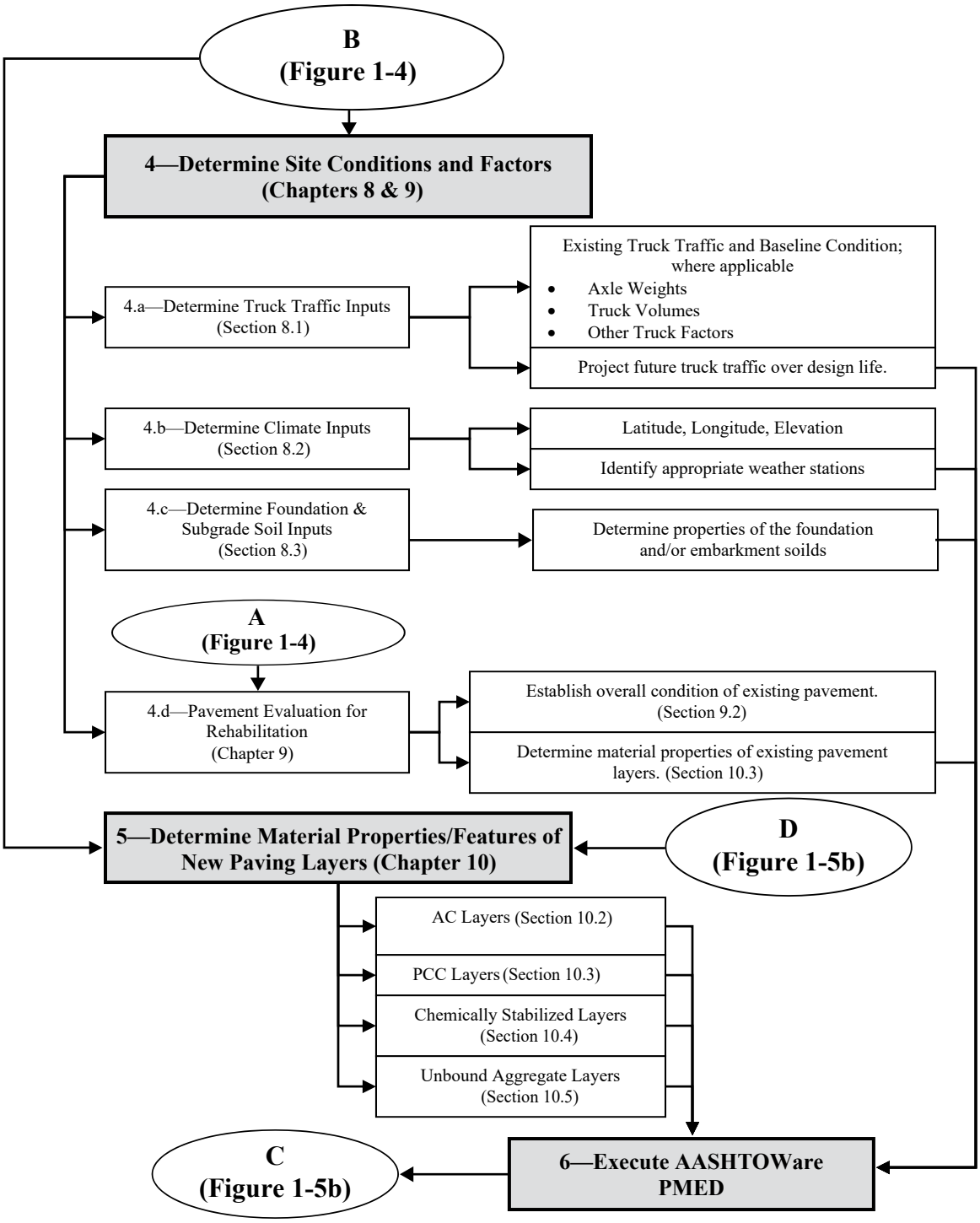


Figure 1-5a. Flow Chart of the Steps Needed to Complete an Analysis of a Trial Design Strategy

© 2026 by the American Association of State Highway and Transportation Officials.
All rights reserved. Duplication is a violation of applicable law.

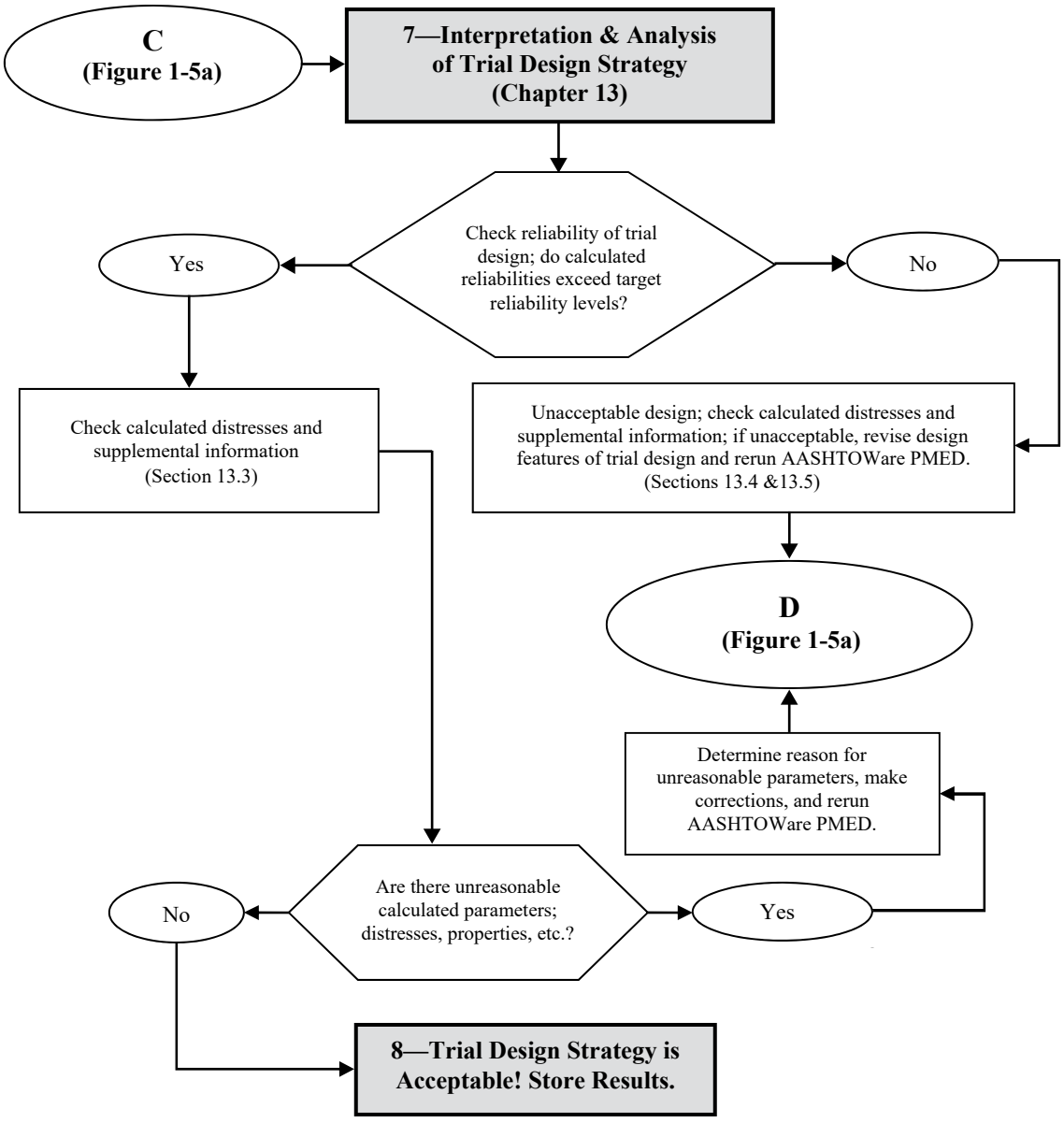


Figure 1-5b. Flow Chart of the Steps Needed to Complete an Analysis of a Trial Design Strategy

© 2026 by the American Association of State Highway and Transportation Officials.
All rights reserved. Duplication is a violation of applicable law.