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LTPP DATA ANALYSIS

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Phase I:

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Validation of Guidelines for  
k-Value Selection and  
Concrete Pavement  
Performance Prediction

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## FOREWORD

This report documents the application of Long-Term Pavement Performance (LTPP) data to evaluate and verify improved guidelines for k-value selection and performance prediction in the design of Portland Cement Concrete (PCC) pavements. The guidelines were originally developed under National Cooperative Highway Research Program (NCHRP) Project No. 1-30, but lacked broad-based field verification prior to the completion of this project.

The positive outcome of this work is expected to result in a recommendation by the American Association of State Highway and Transportation Officials (AASHTO) Joint Task Force on Pavements that the NCHRP 1-30 guidelines be formally adopted by AASHTO as a supplement to the 1993 AASHTO Guide for Design of Pavement Structures. In comparison to the current AASHTO guidelines, the improved guidelines provide expanded capabilities for considering site-specific conditions in PCC pavement design. Their adoption in routine pavement engineering practice will reduce the occurrence of premature failure and minimize life-cycle costs.

This report is critically important to everyone who is designing and building PCC pavements.

*for*   
Charles J. Nemmers, P.E.  
Director  
Office of Engineering  
Research and Development

## NOTICE

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16. Abstract  Several important issues concerning the effect of slab support on concrete pavement performance were studied in a National Cooperative Highway Research Program (NCHRP 1-30), "Support Under Concrete Pavements." The results were promising, however, the data that were available for analysis were limited. This study was conducted to further field-verify and develop the improved support guidelines proposed in NCHRP 1-30, using the Long-Term Pavement Performance (LTPP) database, in order to establish their practicality and appropriateness for use in concrete pavement design nationwide. This study was also conducted to further field-verify the proposed revised American Association of State Highway and Transportation Officials (AASHTO) performance model to the fullest extent possible using the design, materials, climate, traffic, and performance data available in the LTPP database for General Pavement Section 3 (GPS-3) (jointed plain concrete pavement), GPS-4 (jointed reinforced concrete pavement), and GPS-5 (continuously reinforced concrete pavement).  Guidelines, revised on the basis of the results of this field verification study, are presented in the appendix in the form of a proposed addendum to the AASHTO Design Guide. The documentation of these field verification efforts using the LTPP database is provided in this report.					
17. Key Words Concrete pavement, pavement design, pavement performance, performance modeling, design guidelines, AASHTO design			18. Distribution Statement No restrictions. This document is available to the public through the National Technical Information Service, Springfield, Virginia 22161.		
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# SI\* (MODERN METRIC) CONVERSION FACTORS

## APPROXIMATE CONVERSIONS FROM SI UNITS

APPROXIMATE CONVERSIONS TO SI UNITS		APPROXIMATE CONVERSIONS FROM SI UNITS						
Symbol	When You Know	Multiply By	To Find	Symbol	When You Know	Multiply By	To Find	Symbol
<b>LENGTH</b>								
in	inches	25.4	millimeters	mm	millimeters	0.039	inches	in
ft	feet	0.305	meters	m	meters	3.28	feet	ft
yd	yards	0.914	meters	m	meters	1.09	yards	yd
mi	miles	1.61	kilometers	km	kilometers	0.621	miles	mi
<b>AREA</b>								
in <sup>2</sup>	square inches	645.2	square millimeters	mm <sup>2</sup>	square millimeters	0.0016	square inches	in <sup>2</sup>
ft <sup>2</sup>	square feet	0.093	square meters	m <sup>2</sup>	square meters	10.764	square feet	ft <sup>2</sup>
yd <sup>2</sup>	square yards	0.836	square meters	m <sup>2</sup>	square meters	1.195	square yards	yd <sup>2</sup>
ac	acres	0.405	hectares	ha	hectares	2.47	acres	ac
mi <sup>2</sup>	square miles	2.59	square kilometers	km <sup>2</sup>	square kilometers	0.386	square miles	mi <sup>2</sup>
<b>VOLUME</b>								
fl oz	fluid ounces	29.57	milliliters	mL	milliliters	0.034	fluid ounces	fl oz
gal	gallons	3.785	liters	L	liters	0.264	gallons	gal
ft <sup>3</sup>	cubic feet	0.028	cubic meters	m <sup>3</sup>	cubic meters	35.71	cubic feet	ft <sup>3</sup>
yd <sup>3</sup>	cubic yards	0.765	cubic meters	m <sup>3</sup>	cubic meters	1.307	cubic yards	yd <sup>3</sup>
NOTE: Volumes greater than 1000 l shall be shown in m <sup>3</sup> .								
<b>MASS</b>								
oz	ounces	28.35	grams	g	grams	0.035	ounces	oz
lb	pounds	0.454	kilograms	kg	kilograms	2.202	pounds	lb
T	short tons (2000 lb)	0.907	megagrams (or "metric ton")	Mg (or "t")	megagrams (or "metric ton")	1.103	short tons (2000 lb)	T
<b>TEMPERATURE (exact)</b>								
°F	Fahrenheit temperature	5(F-32)/9 or (F-32)/1.8	Celsius temperature	°C	Celsius temperature	1.8C + 32	Fahrenheit temperature	°F
<b>ILLUMINATION</b>								
fc	foot-candles	10.76	lux	lx	lux	0.0929	foot-candles	fc
fl	foot-Lamberts	3.426	candela/m <sup>2</sup>	cd/m <sup>2</sup>	candela/m <sup>2</sup>	0.2919	foot-Lamberts	fl
<b>FORCE and PRESSURE or STRESS</b>								
lbf	poundforce	4.45	newtons	N	newtons	0.225	poundforce	lbf
lbf/in <sup>2</sup>	poundforce per square inch	6.89	kilopascals	kPa	kilopascals	0.145	poundforce per square inch	lbf/in <sup>2</sup>

\* SI is the symbol for the International System of Units. Appropriate rounding should be made to comply with Section 4 of ASTM E380.