

## AASHTO Layer Coefficient Modifiers - Moisture Related

### A probable cause for pavement under-design

#### ww1993 AASHTO Design Equation As Commonly Applied

$$SN = a_1D_1 + a_2D_2 + a_3D_3 + a_4D_4$$

Where:

$a_1, a_2, a_3$  &  $a_4$  are layer coefficients

MDOT standard values

$$a_1 = 0.42$$

$$a_2 = 0.38$$

$$a_3 = 0.14$$

$$a_4 = 0.10$$

#### 1993 AASHTO Design Equation

#### When Accounting for Base & Subbase Moisture Resulting From Seasonal Fluctuations & Storm Events

$$SN = a_1D_1 + a_2D_2 + a_3D_3m_3 + a_4D_4m_4$$

Where:

$a_1, a_2, a_3$  &  $a_4$  are layer coefficients [same as above]

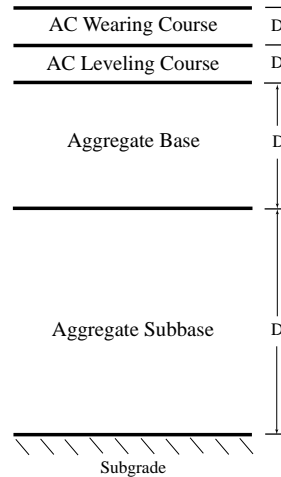
$m_3$  &  $m_4$  are modifiers which reflect the loss in aggregate structural capacity resulting from dynamic load imposition with elevated moisture

$m_3$  &  $m_4$  values are presented in the following table

Quality of Drainage Within Layer	AASHTO $m_3$ & $m_4$ Values			
	% of Time Pavement Materials Are Exposed To Moisture Levels Approaching Saturation			
	< 1%	1% - 5%	5% - 25%	>25%
Excellent	1.40 - 1.35	1.35 - 1.30	1.30 - 1.20	1.20
Good	1.35 - 1.25	1.25 - 1.15	1.15 - 1.00	1.00
Fair	1.25 - 1.15	1.15 - 1.05	1.05 - 0.80	0.80
Poor	1.15 - 1.05	1.05 - 0.80	0.80 - 0.60	0.60
Very Poor	1.05 - 0.95	0.95 - 0.75	0.75 - 0.40	0.40

MDOT 22A and 21AA are dense-graded aggregates that exhibit low permeability and moderate capillarity characteristics, e.g., considered 'Poor' drainage quality.

MDOT Class II may be considered 'Fair' drainage quality.



For the design example shown below, assume:

$$D1 = 2''$$

$$D2 = 3''$$

$$D3 = 10''$$

$$D4 = 12''$$

Subgrade CBR = 3

Standard Michigan weather patterns leave MDOT 21AA, 22A and Class II at elevated moisture contents for Oct., Nov., March & April

#### Design Example Comparison

$$\text{For: } SN = a_1D_1 + a_2D_2 + a_3D_3 + a_4D_4$$

$$SN = 0.42(2) + 0.38(3) + 0.14(10) + 0.10(12)$$

$$SN = 4.58$$

» The corresponding expected ESALs that can be sustained before pavement failure is **1,679,000**

$$\text{For: } SN = a_1D_1 + a_2D_2 + a_3D_3m_3 + a_4D_4m_4$$

$$SN = 0.42(2) + 0.38(3) + 0.14(10)(0.65) + 0.10(12)(0.85)$$

$$SN = 3.91$$

» The corresponding expected ESALs that can be sustained before pavement failure is **547,000**

**Therefore, the functional life expectancy of the road is approximately 1/3 that anticipated via the design expectations as a result of excess base and subbase moisture.**

Contact your *Price & Company Regional Representative* to learn how to prevent premature road failures, excessive maintenance costs and inappropriate road management economics.



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