Simple Design Procedure for New Flexible Pavements Based on the Mechanistic-Empirical Pavement Design Guide

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Presentation outline

* 1 Paper summary
* 2 Background
* 3 Design tables
* 4 Comparison between CPDM and design tables
* 5 Our review
* 6 Questions?

1 Paper summary

* Simpler design method for new flexible pavements
* Developed for New York Department of transportation (NYSDOT)
* Based on only three input values
  * Design life of the pavement (10 – 15 years)
  * Type of subgrade soil
  * Truck traffic volume in the first year

2 Background

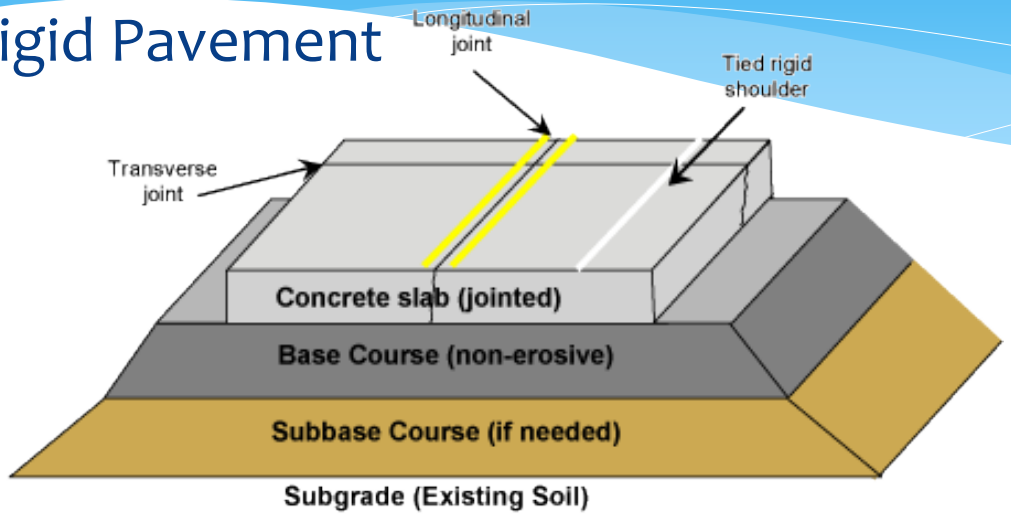
* 2.1 NYSDOT
* 2.2 Pavement types
  * Rigid pavements
  * Flexible pavements
* 2.3 MEPDG

2.1 NYSDOT

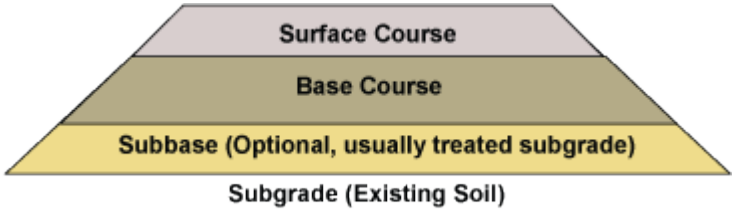
* New York State Department of Transportation
* 11 regions
* Current manual in use, CPDM:
  * Based on AASHTO, DOT and FHA
* Want to use MEPDG for the design of new flexible pavements but lack the expertise

2.2 Pavement Types

* Rigid Pavement



* Flexible Pavement



2.3 MEPDG

* uses mechanistic-empirical numerical models to analyze input data for traffic, climate, materials and proposed structure
* to estimate damage accumulation over service life

3 Design tables

* 3.1 Traffic data analysis
* 3.2 Material characterization
* 3.3 Local calibration
* 3.4 MEPDG-runs for typical design scenarios
* 3.5 Compilation of design tables

3.1 Traffic data analysis

* Data collected from 2006-2011
* Vehicle classification sites and WIM sites around the region

3.2 Material characterization

* Laboratory testing of
  * 40 AC mixes
  * 20 asphalt binders
  * 30 subgrade soils

3.3 Local calibration

* MEPDG performance models were calibrated for the NY region
* Simulation runs
* Traffic level, material, environment and pavement structure

3.4 MEPDG for typical design scenarios

* For different combinations of
  * pavement structure (AC base and granular subgrade layer thicknesses)
  * traffic load level
  * subgrade soil

Top course - HMA	50 mm
Binder course - HMA	75 mm
Base course - HMA	variable
Permeable base course - ATPB	100 mm
Subbase course - crushed stone	300 mm
Select subgrade - crushed stone	variable
Subgrade - soil	semi-infinite

3.5 Compilation of design tables

Subgrade soil		A-1-a		A-1-b		A-2-4		A-2-5	
AADTT in Year 1	ESALs Over 50 Years (millions)	Total HMA (mm)	Selected Subgrade (mm)	Total HMA (mm)	Selected Subgrade (mm)	Total HMA (mm)	Selected Subgrade (mm)	Total HMA (mm)	Selected Subgrade (mm)
50	1.8	125	0	125	0	125	0	125	0
100	3.6	125	0	125	0	150	0	150	0
250	9	150	0	150	0	175	0	175	0
500	17.9	200	0	200	0	200	0	200	0
1,000	35.7	225	0	225	150	225	150	225	150
2,000	71.4	250	150	300	150	300	150	300	150
4,000	142.9	275	300	325	150	325	150	325	150
Subgrade soil		A-2-6		A-2-7		A-3 & A-4		A-5	
AADTT in Year 1	ESALs Over 50 Years (millions)	Total HMA (mm)	Selected Subgrade (mm)	Total HMA (mm)	Selected Subgrade (mm)	Total HMA (mm)	Selected Subgrade (mm)	Total HMA (mm)	Selected Subgrade (mm)
50	1.8	125	0	125	0	125	0	125	0
100	3.6	125	0	150	0	150	0	150	0
250	9	175	0	175	0	175	0	175	0
500	17.9	200	0	200	0	200	0	200	150
1,000	35.7	250	0	250	150	250	300	275	150
2,000	71.4	300	150	325	300	325	300	325	300
4,000	142.9	350	150	350	300	350	300	350	300
Subgrade soil		A-6		A-7-5		A-7-6			
AADTT in Year 1	ESALs Over 50 Years (millions)	Total HMA (mm)	Selected Subgrade (mm)	HMA (mm)	Selected Subgrade (mm)	Total HMA (mm)	Selected Subgrade (mm)		
50	1.8	125	0	125	0	125	0		
100	3.6	150	0	150	0	150	0		
250	9	175	0	175	0	175	0		
500	17.9	225	0	225	0	225	150		
1,000	35.7	275	0	275	150	275	150		
2,000	71.4	325	150	325	150	325	150		
4,000	142.9	350	150	350	150	350	300		

* Region 7
* 10 year design
* A1 – A7 subgrade soil type

4 Comparison to CPDM

		Stiffest Subgrade soil				Softest Subgrade Soil			
		10-year design A-1-a		CPDM Mr=62MPA		10-year design A-7-6		CPDM Mr=28MPA	
AADTT in Year 1	ESALs Over 50 Years (millions)	Total HMA (mm)	Selected Subgrade (mm)	Total HMA (mm)	Selected Subgrade (mm)	Total HMA (mm)	Selected Subgrade (mm)	Total HMA (mm)	Selected Subgrade (mm)
50	1.8	125	0	165	0	125	0	165	0
100	3.6	125	0	165	0	150	0	175	0
250	9	150	0	165	0	175	0	225	0
500	17.9	200	0	175	0	225	150	250	0
1,000	35.7	225	0	200	0	275	150	250	150
2,000	71.4	250	150	225	0	325	150	250	300
4,000	142.9	275	300	250	0	350	300	250	600

5 Our review

* Title and abstract well written
* Some terms and abbreviations unexplained, otherwise quite easy to read
* Simple method?
* Only presented design table for region 7

6 Questions