

Asphalt Mix Design Task Force

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Outline

- What is the Asphalt Mix Design Task Force
- Goals of the MDTF
- Specifications of interest
- Efforts
- Where are we now?
- Where are we going?



What is the Mix Design Task Force

- Group assembled to evaluate our current asphalt mix designs and explore ways to make them better
- Combination of VDOT and Industry

Ben Bowers, co-chair, VTRC
Sungho Kim, co-chair, VDOT Mats
David Lee, VDOT Salem District
Tanveer Chowdhury, VDOT PM
Angela Beyke, VDOT Mats
Stacey Diefenderfer, VTRC
Tommy Schinkel, VDOT Richmond
District

Ed Dalrymple, VTCA
Trenton Clark, VAA
Rick James, Adams Construction Co
Dave Helmick, Superior Paving Corp
Rob Schwear, Allan Myers
Vanna Lewis, FHWA



MDTF Goals

- TASK 1. Benchmark key, current asphalt mixture attributes. This includes VTRC's 50-yration study and 2016 MITS/PLAID data.
- TASK 2. Collect national information about ongoing work to improve mix design procedures for performance.



2015-2016 Specification Changes

TABLE II-14
Mix Design Criteria

Mix Type	VTM (%) Production	VFA (%) Design	VFA (%) Production	Min. VMA (%)	Fines/Asphalt Ratio	No. of Gyration N Design
SM-9.0A ^{1,2}	2.0-5.0	75-80	70-85	16	0.6-1.3	65
SM-9.0D ^{1,2}	2.0-5.0	75-80	70-85	16	0.6-1.3	65
SM-9.0E ^{1,2}	2.0-5.0	75-80	70-85	16	0.6-1.3	65
SM-9.5A ^{1,2}	2.0-5.0	75-80	70-85	16	0.7-1.3	50
SM-9.5D ^{1,2}	2.0-5.0	75-80	70-85	16	0.7-1.3	50
SM-9.5E ^{1,2}	2.0-5.0	75-80	70-85	16	0.7-1.3	50
SM-12.5A ^{1,4}	2.0-5.0	73-79	68-84	15	0.7-1.3	50
SM-12.5D ^{1,2}	2.0-5.0	73-79	68-84	15	0.7-1.3	50
SM-12.5E ^{1,2}	2.0-5.0	73-79	68-84	15	0.7-1.3	50
IM-19.0A ^{1,2}	2.0-5.0	69-76	64-81	13	0.6-1.2	65
IM-19.0D ^{1,2}	2.0-5.0	69-76	64-81	13	0.6-1.2	65
IM-19.0E ^{1,4}	2.0-5.0	69-76	64-81	13	0.6-1.2	65
BM-25.0A ^{2,3}	1.0-4.0	67-87	67-92	12	0.6-1.3	65
BM-25.0D ^{2,3}	1.0-4.0	67-87	67-92	12	0.6-1.3	65

¹Asphalt content should be selected at 4.0% air voids for A & D mixes, 3.5% air voids for E mix.

²Fines-asphalt ratio is based on effective asphalt content.

³Base mix shall be designed at 2.5% air voids. BM-25A shall have a minimum asphalt content of 4.4% unless otherwise approved by the Engineer. BM-25D shall have a minimum asphalt content of



2015-2016 Specification Changes

TABLE II-13
Asphalt Concrete Mixtures: Design Range

Mix Type	Percentage by Weight Passing Square Mesh Sieves											
	2 in	1 1/2 in	1 in	3/4 in	1/2 in	3/8 in	No. 4	No. 8	No. 30	No. 50	No. 200	
SM-9.0 A,D,E					100 ¹	90-100	90 max.	47-67				2-10
SM-9.5 A,D,E					100 ¹	90-100	58-80	38-67	23 max			2-10
SM-12.5 A,D,E				100	95-100	90 max.	58-80	34-50	23 max			2-10
IM-19.0 A,D,E			100	90-100	90 max.	--	--	28-49				2-8
BM-25.0 A,D		100	90-100	90 max.	--	--	--	19-38				1-7
C (Curb Mix)					100	92-100	70-75	50-60	28-36	15-20		7-9

¹A production tolerance of 1% will be applied to this sieve regardless of the number of tests in the lot.



What should these changes help?

- 50-gyrations and VMA increase
 - In some cases, increase the asphalt content
 - Assist in achieving increased density in the field
 - Make mixes somewhat fine
 - Decrease permeability
- Addition of maximum on #30 sieve
 - Prevent overuse of fine material to achieve VMA
- Changes *only look at typical surface mixes*
 - Base mix, intermediate mix, and SM-9.0 unchanged



So what have we been up to?

- First meeting:
 - Introduce goals
 - TASK 2 conversation started:
 - Balanced Mix Design – Tim Aschenbrener, FHWA
 - NCAT Cracking Group Study – Randy West, NCAT
 - Superpave 5 – Rebecca McDaniel, NCSC/Purdue University
 - Michigan Regression Method – Pete Capon, Reith-Riley
- Second Meeting
 - Recap meeting one / discussion
 - Establish TASK 1 metrics



Metrics Defined for TASK 1

- VDOT Materials
 - Compare AC contents
 - In-place density this year vs. last year
 - Permeability for 2016 50-gyration mixes
- VTRC
 - Compare AC contents between 50 and 65 gyration mixes
 - In-place density comparison
 - Permeability
 - Semi-Circular Bend test for cracking
- VDOT Materials / VTRC
 - Film thickness *and* effective asphalt content
 - Evaluate changes in ride quality



So what have we been up to?

- Third meeting
 - Web meeting
 - Provided preliminary data from
 - VTRC 50-gyraton study from Summer 2015 pilot projects
 - VDOT Materials MITS/PLAID data mining from 2016
 - VTRC In-Place Density Trials (Kevin McGhee)
- Fourth Meeting
 - Schedule TBA, Winter months
 - Provide completed data sets

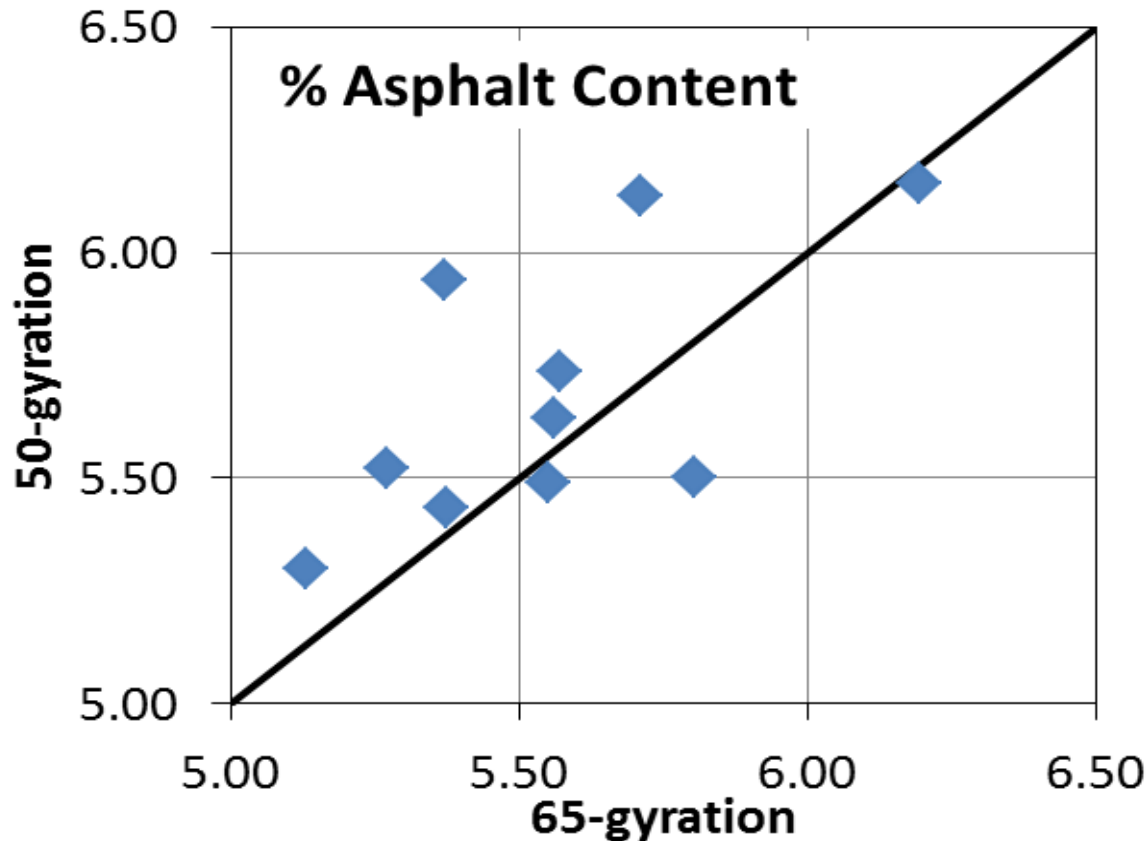


2015: VTRC 50-gyration Study

- VTRC led study examining 50-gyration mixes versus 65-gyration mixes
- 11 projects from around the state
 - Each had a 65 and 50 gyration pair
 - Pairs were the same mix type
 - All mixes were SM-9.5 A/D or SM-12.5 A/D
- Data:
 - Volumetrics / Permeability
 - Performance Tests



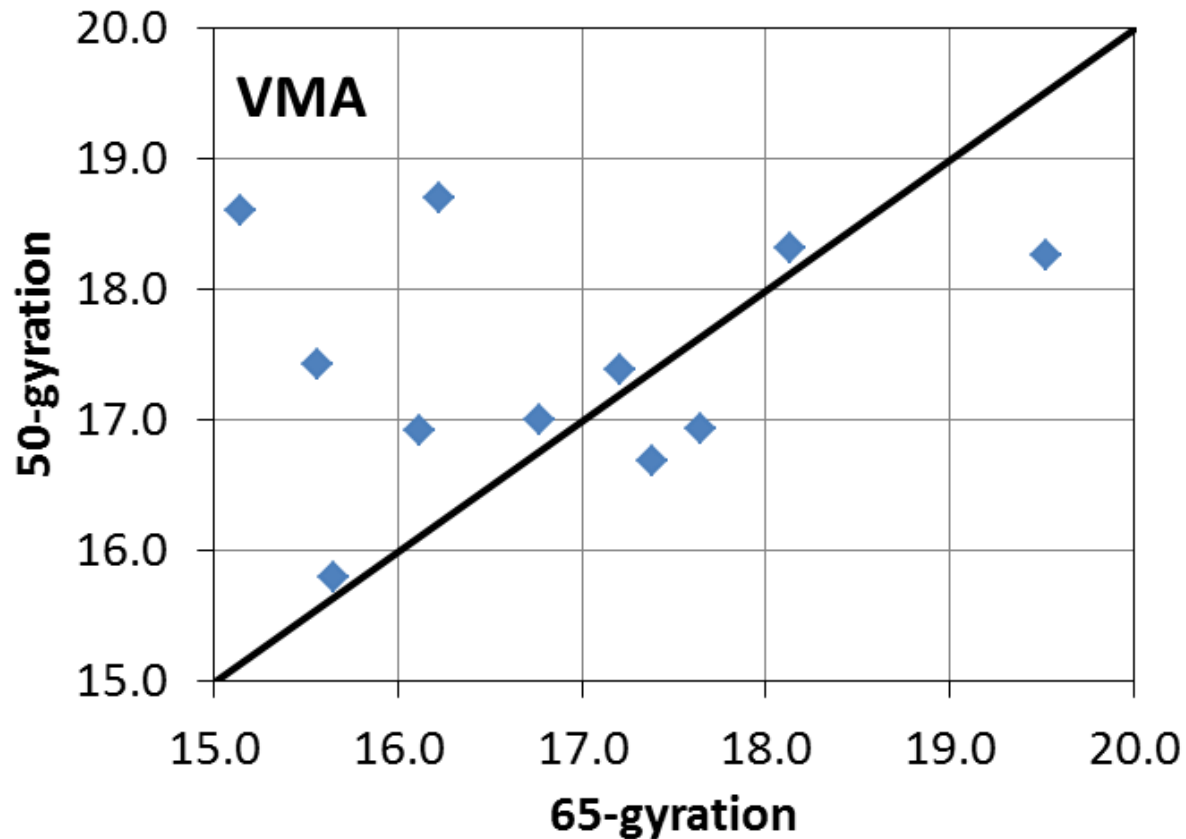
% Asphalt Content



- Average of 5.76% for 50-yration mixes
- Average of 5.58% for 65-yration mixes
- Average increase of 0.18% for 50-yration mixes



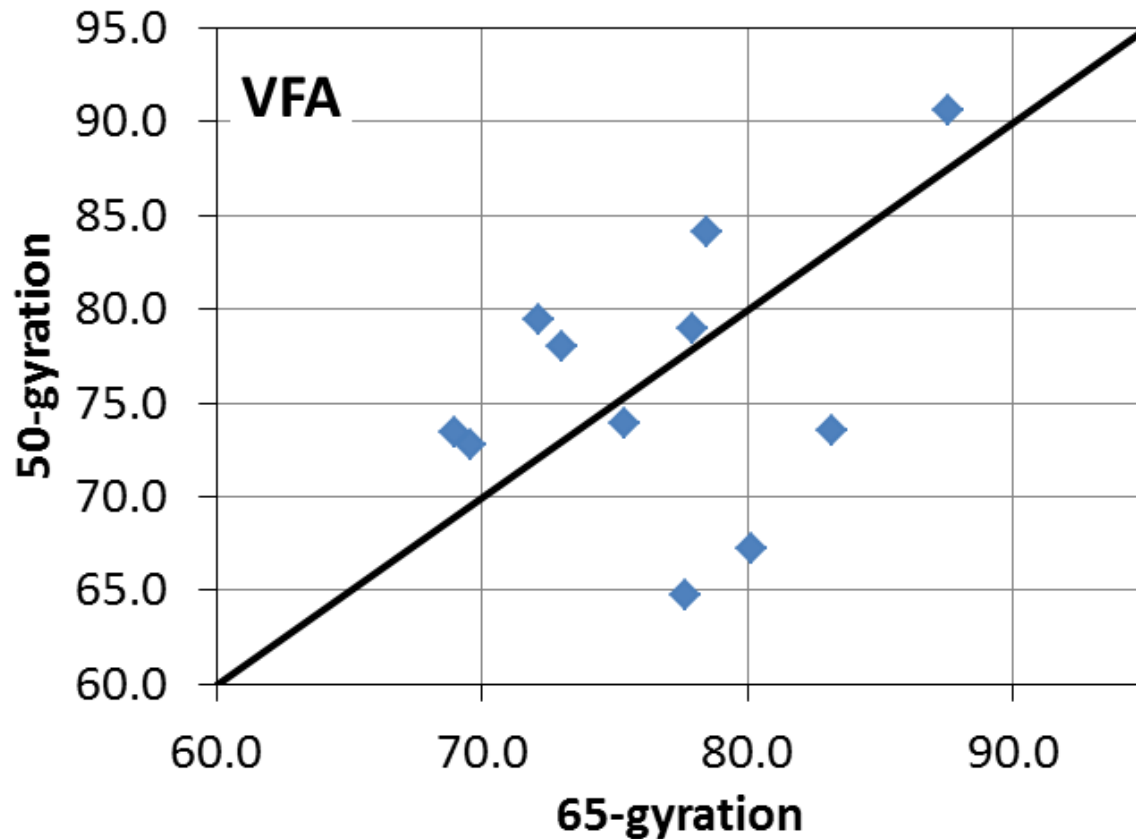
VMA



- Average of 17.5 for 50-yr VMA mixes
- Average of 16.8 for 65-yr VMA mixes
- Average increase of 0.70 for 50-yr VMA mixes



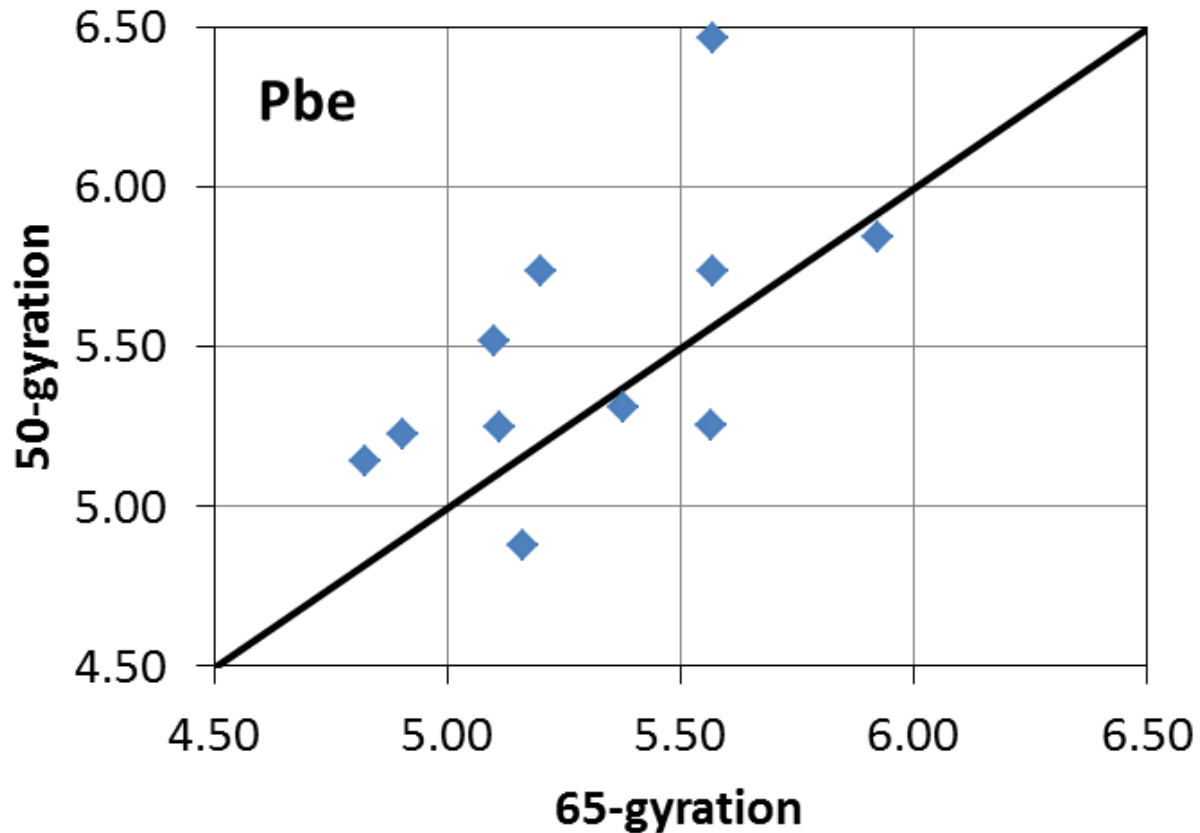
VFA



- Average decrease of 1.54 for 50-gyration mixes
- Decrease controlled by three 65-gyration sample mixes



Percent Effective Binder



- Increase of 0.18% for 50-yr mixes



Where are we now?

- The data collected *to date* indicates changes to the mix design have been beneficial
 - Slight increase in total asphalt content
 - Slight increase in effective asphalt content
 - Density seems to be more easily achieved
- Still collecting data through the 2016 season!



Where are we going?

- The group will convene a few more times and ultimately make recommendations
- Recommendations will be considered by the State Materials Engineer
 - These will be appropriately vetted by VDOT/Industry



Questions?

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