WisDOT Asphalt Bid/Mix Specification Updates

Barry Paye, P.E.
Wisconsin DOT Materials Lab

2016 Combining HMA Bid Items

- When
  - 2017 Standard Specification
  - Available by STSP in February 2016
- Why
  - Streamline the bidding and estimating processes
  - Aid design/development staff in preparing estimates
  - Simplify the choice of PG Binders for the marketplace

Combining Bids - What Is It?

Combined Bid will take the asphalt binder (PG) and mix type (ESALs, gradation/NMAS, etc) and combine them into a single bid item

This allows for WisDOT to provide a shortlist of approved mix types to be bid

Mix Selection System

- Steps: Sub Sandwich Pavement Selection
  - Step 1: Aggregate Gradation (Nmax) (Bread)
  - Step 2: Traffic Category (Meat)
  - Step 3: PG Binder (Veggies)
  - Step 4: PG Binder Traffic Designation (Cheese)
- Result – Mix from the list – LUNCH!!!

Step 1: Gradation (Nmas) – Bread

- Know what layer you are designing
- Old SS 460
  - 12.5mm Upper Layer
  - 19mm Lower Layer

Step 1: Gradation (Nmas) – Bread

- New System
  - 1 – 37.5 mm
  - 2 – 25.0 mm
  - 3 – 19.0 mm
  - 4 – 12.5 mm
  - 5 – 9.5 mm
  - 6 – 4.75 mm

- Upper Layer Options
  - 4 -12.5 mm
  - 5 – 9.5 mm
  - 6 – 4.75 mm

- Lower Layer Options
  - 2 – 25.0 mm
  - 3 – 19.0 mm
  - 4 – 12.5 mm

Step 1: Gradation (Nmas) – Bread

- New System
  - 1 – 37.5 mm
  - 2 – 25.0 mm
  - 3 – 19.0 mm
  - 4 – 12.5 mm
  - 5 – 9.5 mm
  - 6 – 4.75 mm

- Upper Layer Options
  - 4 -12.5 mm
  - 5 – 9.5 mm
  - 6 – 4.75 mm

- Lower Layer Options
  - 2 – 25.0 mm
  - 3 – 19.0 mm
  - 4 – 12.5 mm

Step 2: Traffic Level (Meat)

Existing		New	
Load Category	ESALs	Category	ESALs
E0.3	<300,000	LT	< 2 million
E1	300,000 to < 1 million		
E3	1 million to <3 million	MT	2 million to <8 million
E10	3 million to <10 million		
E30	10 million to <30 million	HT	≥8 million
E30X	>30 million		
SMA	Not Rated	SMA	consider for ≥5 million

Step 2: Traffic Level (Meat)

Existing		New	
Load Category	ESALs	Category	ESALs
E0.3	<300,000	LT	< 2 million
E1	300,000 to < 1 million		
E3	1 million to <3 million	MT	2 million to <8 million
E10	3 million to <10 million		
E30	10 million to <30 million	HT	≥8 million
E30X	>30 million		
SMA	Not Rated	SMA	consider for ≥5 million

Reduces 7 mix categories to 4 – Fewer mix designs!

Step 2: Traffic Level (Meat)

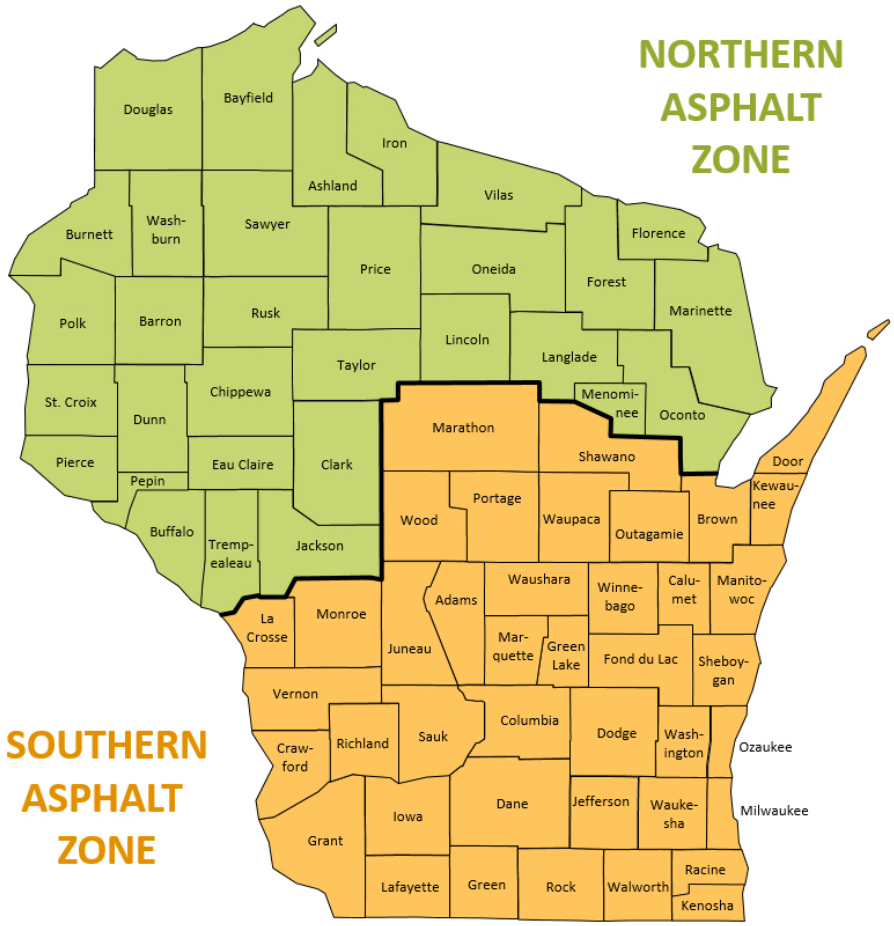
Existing		New	
Load Category	ESALs	Category	ESALs
E0.3	<300,000	LT	< 2 million
E1	300,000 to < 1 million		
E3	1 million to <3 million	MT	2 million to <8 million
E10	3 million to <10 million		
E30	10 million to <30 million	HT	≥8 million
E30X	>30 million		
SMA	Not Rated	SMA	consider for ≥5 million

2 Categories – Most common for local work

Step 3: Binder Grades (Veggies)

- Remember – Where am I?
  - Northern or Southern Zone
- Layer
  - Lower or Upper

Step 3: Wisconsin Climate Zones



Step 3: Binder Grades (Veggies)

- Northern Zone
  - New construction, reconstruction or pavement replacement
    - Upper Layers: PG 58-34
    - Lower Layers: PG 58-28
  - Other projects (Overlay, etc.)
    - All Layers: PG 58-28

Step 3: Binder Grades (Veggies)

- Southern Zone
  - All Layers, All types of construction (replacement & overlay)
  - PG 58-28

Step 4: Binder Traffic Designation (Cheese)

- Based on Multiple Stress Creep Recovery (MSCR) testing at the climatic high temperature at the design location (AASHTO M332 Testing)
- Grade bumping to be adjusted using MSCR designation, not E mix or PG Grade
  - Ex: Moving from an E1 to an E3
  - Ex: Moving from a PG 58-28 to a PG 64-28

Step 4: Binder Traffic Designation (Cheese)

- Binder grades to be based on expected traffic level:
  - S – Standard – Normal projects
  - H – Heavy – Higher truck movements, roundabouts, turn lanes
  - V – Very Heavy – Extreme traffic, stopping & starting
  - E – Extremely Heavy – Toll Booths, Port Facilities (Not included)
- Example (old to new): PG 64-28P → PG 58-28 H
  - H, V & E replaces the “P” Grades

Step 4: Binder Traffic Designation (Cheese)

-Binder grades to be based on expected traffic level:

- **S – Standard – Normal projects**
- **H – Heavy – Higher truck movements, roundabouts, turn lanes**
- V – Very Heavy – Extreme traffic, stopping & starting
- E – Extremely Heavy – Toll Booths, Port Facilities (Not included)

-Example (old to new): PG 64-28P → PG 58-28 H

Step 4: Binder Traffic Designation

Specified Binders for Wisconsin

Old System	New System
58-28	58-28 S
64-28	58-28 H
70-28	58-28 V
58-34	58-34 S
64-34	58-34 H
70-34	58-34 V

Step 4: Binder Traffic Designation

Specified Binders for Wisconsin

Old System	New System
58-28	**58-28 S**
64-28	**58-28 H**
70-28	58-28 V
58-34	**58-34 S**
64-34	**58-34 H**
70-34	58-34 V

Let's put it all together!

Step 1		Step 2		Step 3	Step 4	
Gradations (Nmas)		**Traffic Level**		**Asphalt Binder**	**Designation Level**	
1	37.5 mm	LT	Low Traffic Vol. (40 gyrations)	58-34	S	Standard
2	25.0 mm	MT	Medium Traffic Vol. (75 gyrations)	58-28	H	Heavy
3	19.0 mm	HT	High Traffic Vol. (100 gyrations)		V	Very Heavy
4	12.5 mm				E	Extremely Heavy
5	9.5 mm					
6	4.75 mm					

Let's put it all together!

Step 1		Step 2		Step 3	Step 4	
Gradations (Nmas)		Traffic Level		Asphalt Binder	Designation Level	
1	37.5 mm	LT	Low Traffic Vol. (40 gyrations)	58-34	S	Standard
2	25.0 mm	MT	Medium Traffic Vol. (75 gyrations)	58-28	H	Heavy
3	19.0 mm	HT	High Traffic Vol. (100 gyrations)		V	Very Heavy
4	12.5 mm				E	Extremely Heavy
5	9.5 mm					
6	4.75 mm					

4 LT 58-34 S

Gradation	Traffic Level	Binder Grade	Binder Designation

So, for this example:

- Gradation = 12.5 mm
- Traffic Level = < 2 mil ESALs
- Binder Grade = 58-34
- Binder Designation = Standard

< 2 Mil ESALs			
Low Volume			
3	LT	58-34	S
4	LT	58-34	S
5	LT	58-34	S
3	LT	58-28	S
4	LT	58-28	S
5	LT	58-28	S

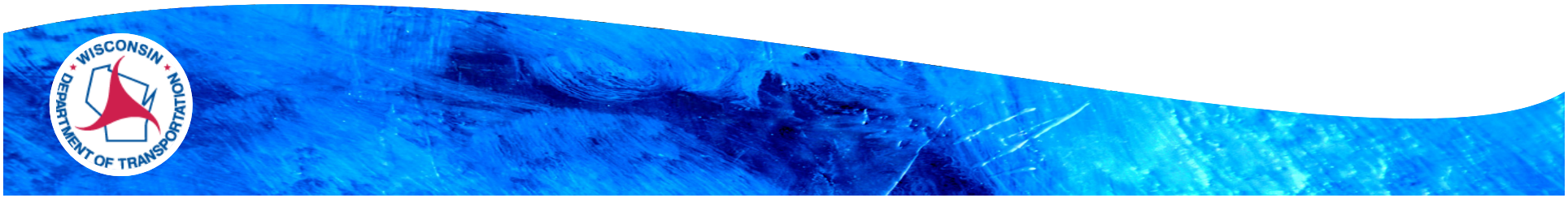
2 to <8 Mil ESALs			
Med Volume			
2	MT	58-34	S
3	MT	58-34	S
4	MT	58-34	S
5	MT	58-34	S
2	MT	58-28	S
3	MT	58-28	S
4	MT	58-28	S
5	MT	58-28	S
4	MT	58-34	H
5	MT	58-34	H
4	MT	58-28	H
5	MT	58-28	H

>8 Mil ESALs			
High Volume			
2	HT	58-34	S
3	HT	58-34	S
4	HT	58-34	S
5	HT	58-34	S
2	HT	58-28	S
3	HT	58-28	S
4	HT	58-28	S
5	HT	58-28	S
2	HT	58-34	H
3	HT	58-34	H
4	HT	58-34	H
5	HT	58-34	H
2	HT	58-28	H
3	HT	58-28	H
4	HT	58-28	H
5	HT	58-28	H
4	HT	58-34	V
5	HT	58-34	V
4	HT	58-28	V
5	HT	58-28	V

>5 Mil ESALs			
SMA			
4	SMA	58-34	H
5	SMA	58-34	H
4	SMA	58-28	H
5	SMA	58-28	H
4	SMA	58-34	V
5	SMA	58-34	V
4	SMA	58-28	V
5	SMA	58-28	V

Total of 46 bid combinations.

System easily amendable as changes are needed.



< 2 Mil ESALs			
Low Volume			
3	LT	58-34	S
4	LT	58-34	S
5	LT	58-34	S
3	LT	58-28	S
4	LT	58-28	S
5	LT	58-28	S

2 to <8 Mil ESALs			
Med Volume			
2	MT	58-34	S
3	MT	58-34	S
4	MT	58-34	S
5	MT	58-34	S
2	MT	58-28	S
3	MT	58-28	S
4	MT	58-28	S
5	MT	58-28	S
4	MT	58-34	H
5	MT	58-34	H
4	MT	58-28	H
5	MT	58-28	H

>8 Mil ESALs			
High Volume			
2	HT	58-34	S
3	HT	58-34	S
4	HT	58-34	S
5	HT	58-34	S
2	HT	58-28	S
3	HT	58-28	S
4	HT	58-28	S
5	HT	58-28	S
2	HT	58-34	H
3	HT	58-34	H
4	HT	58-34	H
5	HT	58-34	H
2	HT	58-28	H
3	HT	58-28	H
4	HT	58-28	H
5	HT	58-28	H
4	HT	58-34	V
5	HT	58-34	V
4	HT	58-28	V
5	HT	58-28	V

>5 Mil ESALs			
SMA			
4	SMA	58-34	H
5	SMA	58-34	H
4	SMA	58-28	H
5	SMA	58-28	H
4	SMA	58-34	V
5	SMA	58-34	V
4	SMA	58-28	V
5	SMA	58-28	V

Locals:

Total of 16 most likely bid combinations.

< 2 Mil ESALs			
Low Volume			
3	LT	58-34	S
4	LT	58-34	S
5	LT	58-34	S
3	LT	58-28	S
4	LT	58-28	S
5	LT	58-28	S

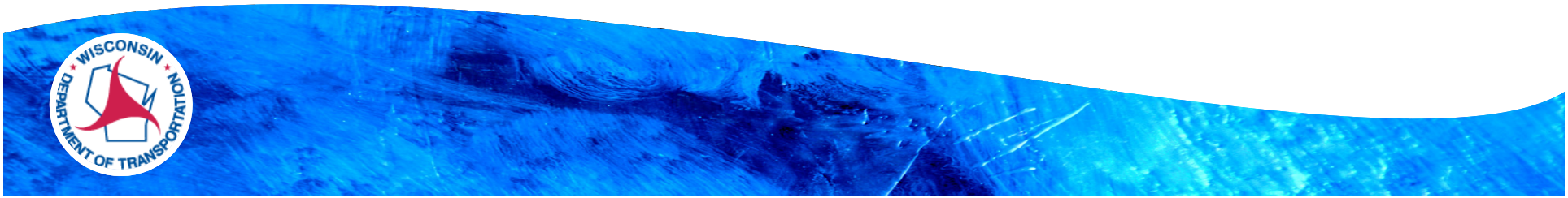
2 to <8 Mil ESALs			
Med Volume			
2	MT	58-34	S
3	MT	58-34	S
4	MT	58-34	S
5	MT	58-34	S
2	MT	58-28	S
3	MT	58-28	S
4	MT	58-28	S
5	MT	58-28	S
4	MT	58-34	H
5	MT	58-34	H
4	MT	58-28	H
5	MT	58-28	H

>8 Mil ESALs			
High Volume			
2	HT	58-34	S
3	HT	58-34	S
4	HT	58-34	S
5	HT	58-34	S
2	HT	58-28	S
3	HT	58-28	S
4	HT	58-28	S
5	HT	58-28	S
2	HT	58-34	H
3	HT	58-34	H
4	HT	58-34	H
5	HT	58-34	H
2	HT	58-28	H
3	HT	58-28	H
4	HT	58-28	H
5	HT	58-28	H
4	HT	58-34	V
5	HT	58-34	V
4	HT	58-28	V
5	HT	58-28	V

>5 Mil ESALs			
SMA			
4	SMA	58-34	H
5	SMA	58-34	H
4	SMA	58-28	H
5	SMA	58-28	H
4	SMA	58-34	V
5	SMA	58-34	V
4	SMA	58-28	V
5	SMA	58-28	V

Locals:

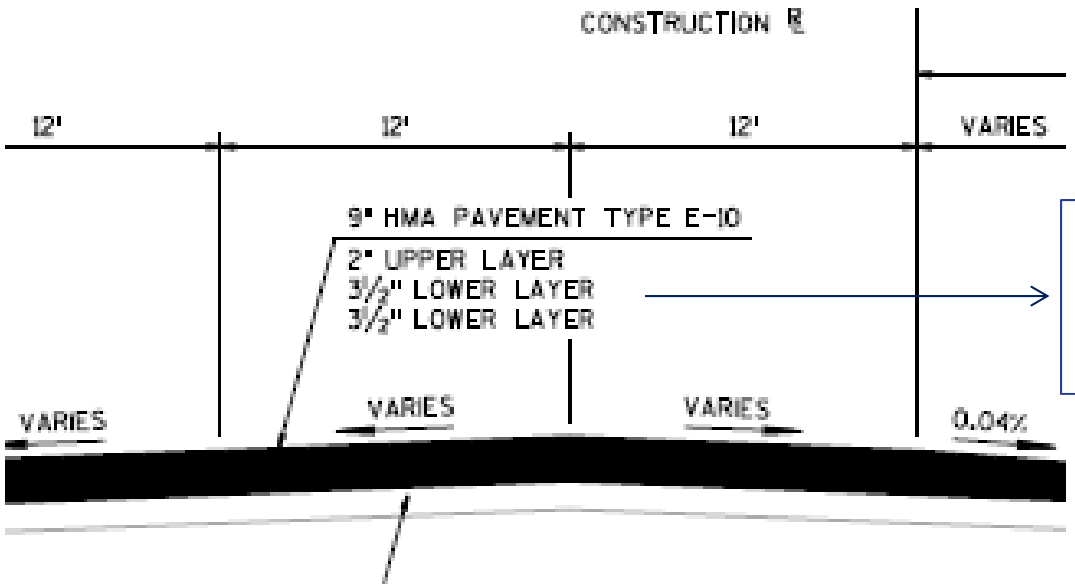
6 Dominant mix types!



Guidance Tools

- FDM Chapter 14-10.5
  - Updated to provide guidance
  - Step through the process
- Examples to be inserted in Pavement Design Manual (WisPAVE Manual)
- WAPA
  - Handout Guide
  - Website Selection Tool
    - www.wispave.org

Example – 141 Marinette County



9” New Construction
2” – 4 HT 58-34 S
7” – 3 HT 58-28 S

You pick the new pavement

Design Information:

- County trunk highway in Ashland County
- 1.4 million design ESAL's
- 2" Mill & Overlay project
- No major traffic generator
- Not a major log hauling route

- Choices:
- A: 3 LT 58-28 S
- B: 4 MT 58-34 H
- C: 4 LT 58-28 S
- D: 2 HT 58-34 S

You pick the new pavement

Design Information:

- County trunk highway in Ashland County
- 1.4 million design ESAL's
- 2" Mill & Overlay project
- No major traffic generator
- Not a major log hauling route

- Choices:
- A: 3 LT 58-28 S
- B: 4 MT 58-34 H
- **C: 4 LT 58-28 S**
  - **12.5mm, Low Traffic, Standard PG Grade & Traffic**
- D: 2 HT 58-34 S

You pick the new pavement (2)

Design Information:

- County trunk highway in Dane County
- 2.4 million design ESAL's
- 5" Roundabout – new construction
- Pavement Designer has chosen a 2" 12.5mm upper and 3" 19mm lower layer

- Choices:
- A: Up: 2" 4 MT 58-28 S
  Lower: 3" 3 MT 58-34 S
- B: Up: 2" 4 LT 58-34 S
  Lower: 3" 3 LT 58-28 S
- C: Up: 2" 4 MT 58-28 H
  Lower: 3" 3 MT 58-28 S

You pick the new pavement (2)

Design Information:

- County trunk highway in Dane County
- 2.4 million design ESAL's
- 5" Roundabout – new construction
- Pavement Designer has chosen a 2" 12.5mm upper and 3" 19mm lower layer

- Choices:
- A: Up: 2" 4 MT 58-28 S
  Lower: 3" 3 MT 58-34 S
- B: Up: 2" 4 LT 58-34 S
  Lower: 3" 3 LT 58-28 S
- C: Up: 2" 4 MT 58-28 H
  Lower: 3" 3 MT 58-28 S

Contacts

- Barry Paye
  - Barry.paye@dot.wi.gov
  - 608-246-7945
- Russ Frank
  - Russel.frank@dot.wi.gov
  - 608-246-7930
- Jeff Anderson
  - Jeffrey.anderson@dot.wi.gov
  - 608-246-5456

- WAPA
  - www.wispave.org
  - 608-255-3114
  - Brandon Strand
    - strand@wispave.org
  - Deb Schwerman
    - deb@wispave.org