HMA Specification Updates

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WAPA Annual Conference

What we've heard…..

- "Why are our pavements turn… so quickly?"
- "Our pavements don't se… as long as they used to."
- "How come our p… crack so quickly?"
- "Is WisDOT g… anything to improve this?"

WE WERE LISTENING!!!

Air Void Regression

Recognized the need to increase durability

- Since the inception of Superpave mixtures, Wisconsin has seen a decrease in total percent binder of its mixes.
- Efforts have been made to get more asphalt into the mixtures as the VMA requirement was increased by 0.5% for LT & MT surface mixtures in 2015.

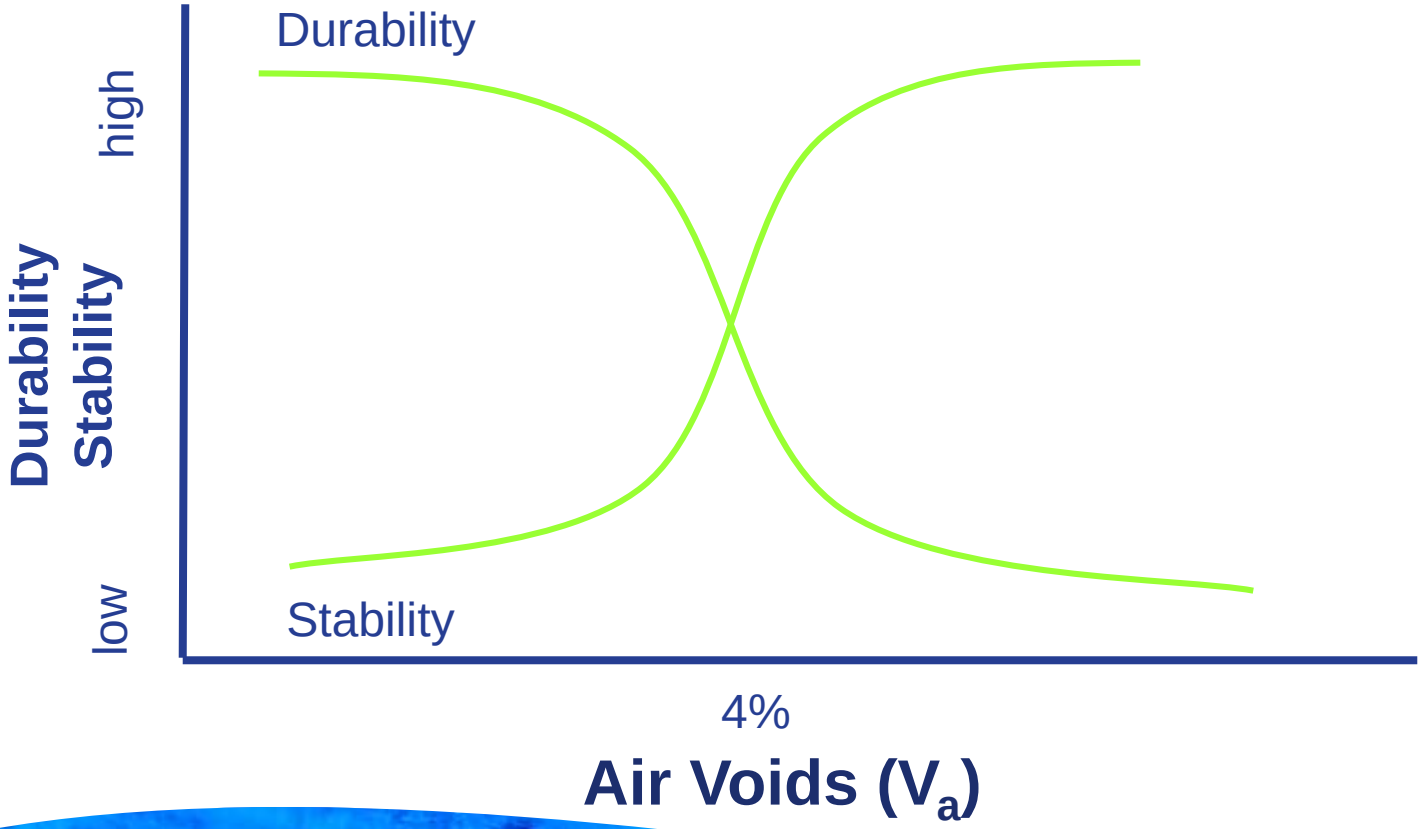
Air void regression 101

- All asphaltic mix designs will remain at 4.0%
- Varying of asphalt contents during mix design is used to determine the optimum ac needed to achieve 3.0% air voids
- Several projects across the state have utilized the requirement already, and this will be used for all mixes (excluding SMA) beginning in 2017

So why air void regression?

- WisDOT is confident with the current dense graded aggregate structure
- We wanted virgin asphalt binder to be added, not recycled binder
- This was a quick, calculated way to positively improve the mix without redesigning hundreds of mixes

Air Voids Relationships



(For a given aggregate structure)

Air void regression benefits

- Addition of virgin asphalt binder (approx. 0.3-0.4%)
- Increased durability, increased asphalt film thickness
- Increased in place density/decreased permeability
- Improved workability- easier paving

What else changes with air void regression?

- The nuclear density targets were adjusted:
  - Upper layer densities adjusted up to 93%
  - Shoulder densities to 92%
- **Should yield greater than 10% increase in pavement life**

*Requirements are still lowered by if constructed over crushed aggregate or recycled base

Percent Within Limits (PWL)

Benefits of PWL

- Better tracking of mixture specifics
- More discerning than other quality measures
- Statistical measure of quality
- Encourages Uniformity
  - Controls both the average level and variability of the product in a statistically efficient way
  - Variability is a predictor of performance

Comparison

Current QMP

- 4 point running average

Volumetrics:

- HMA lot sizes are variable
  - (600, 900, 1200, 1500, etc…)

Densities:

- Nuclear Gauges are not correlated to specific mix

PWL

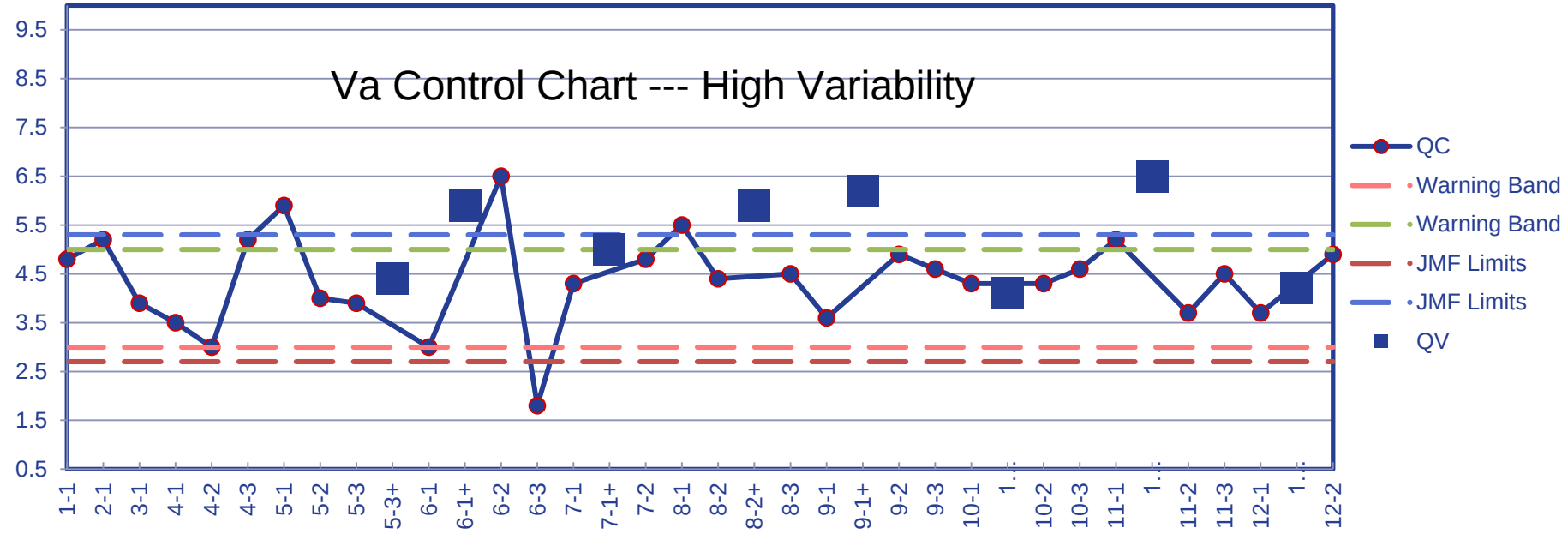
- Statistically based (Individual tests)
- QV tests become more statistically meaningful

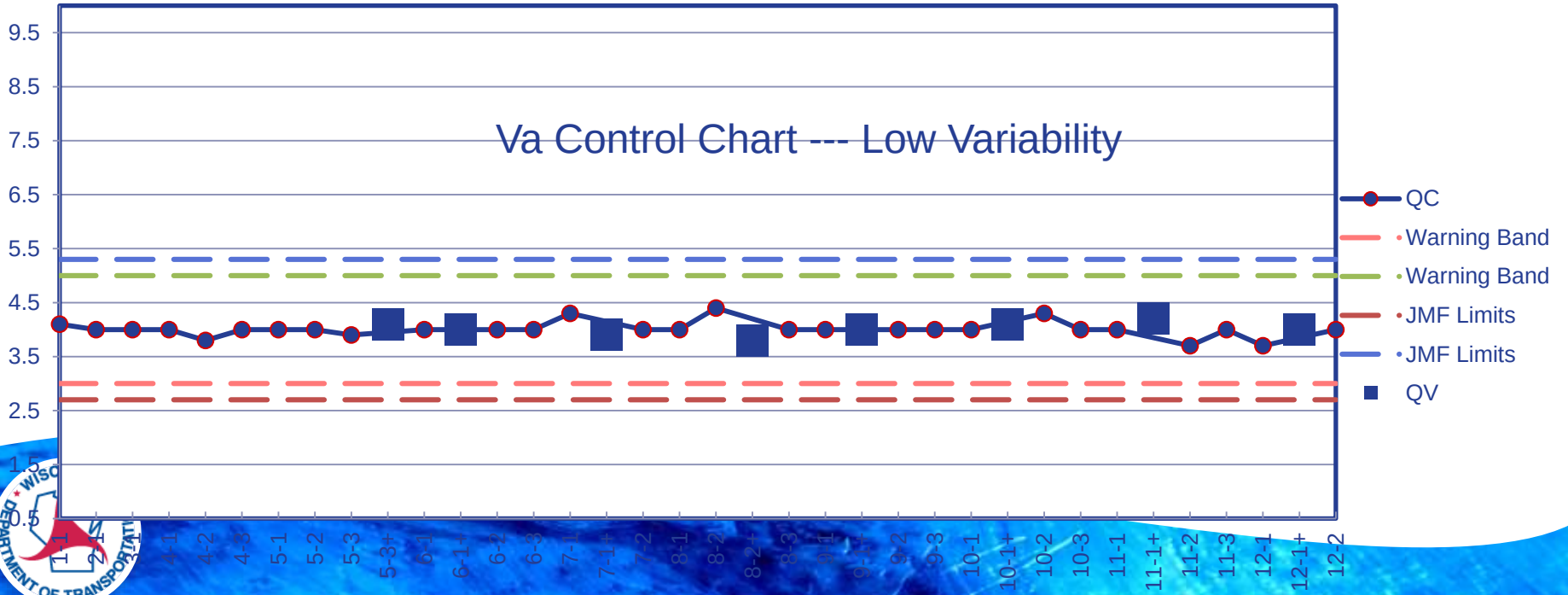
Volumetrics:

- HMA lot size = 3750 ton
- Sublot size = 750 ton

Densities

- Lot sizes will not change with PWL
- Nuclear gauges are correlated to specific mix for each layer using cores


Va Control Chart --- High Variability
9.5
8.5
7.5
6.5
5.5
4.5
3.5
2.5
1.5
0.5
1-1
2-1
3-1
4-1
4-2
4-3
5-1
5-2
5-3
5-3+
6-1
6-1+
6-2
6-3
7-1
7-1+
7-2
8-1
8-2
8-2+
8-3
9-1
9-1+
9-2
9-3
10-1
10-2
10-3
11-1
11-2
11-3
12-1
12-2
QC
Warning Band
Warning Band
JMF Limits
JMF Limits
QV


Va Control Chart --- Low Variability
9.5
8.5
7.5
6.5
5.5
4.5
3.5
2.5
1.5
0.5
1-1
2-1
3-1
4-1
4-2
4-3
5-1
5-2
5-3
5-3+
6-1
6-1+
6-2
6-3
7-1
7-1+
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8-1
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11-1+
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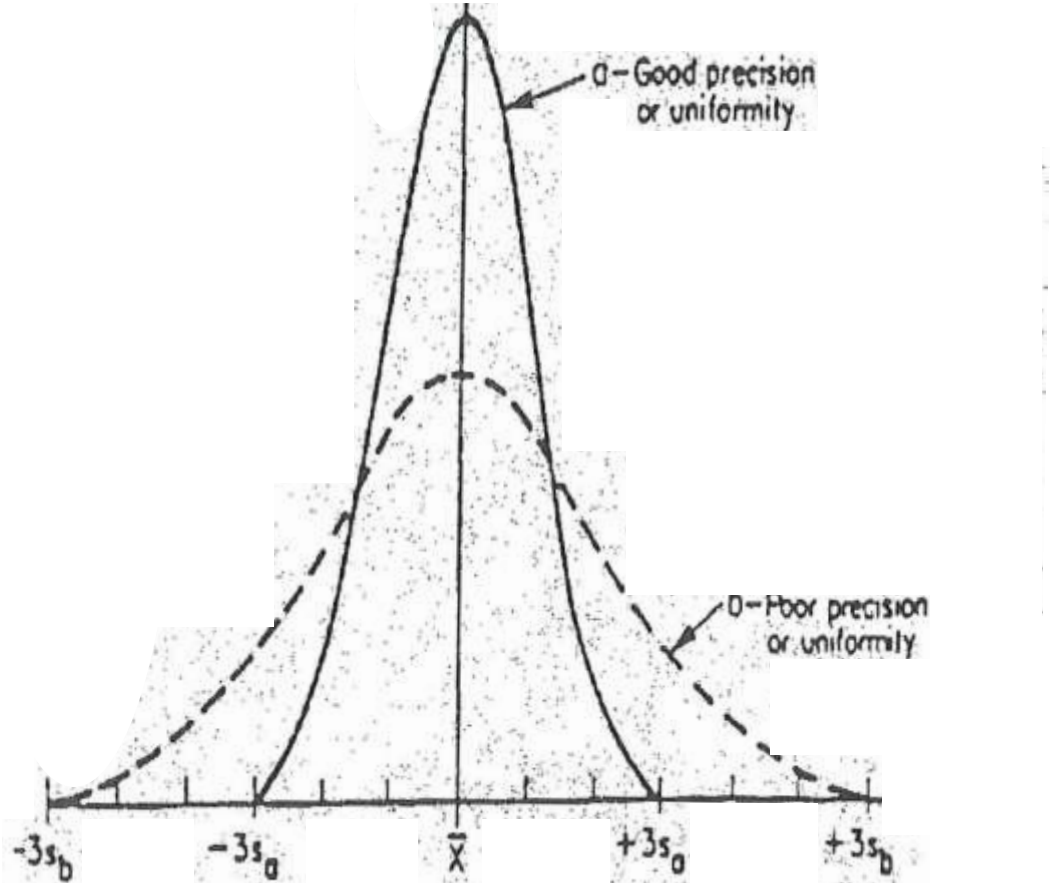
QC
Warning Band
Warning Band
JMF Limits
JMF Limits
QV

PWL (Percent Within Limits)



When will it be used

- Pilot projects in 2016
  - Goal was 1 project/Region (SW, NE, & NC)
- Pilot projects in 2017
  - Goal is 2 projects/Region (20 scheduled, 10 by NE)
- Implementation beginning 2018
  - Will evaluate Pilot Project data
    - Adjustments may be needed before full implementation
    - Round 1: projects with > 11,250 tons per mix type
    - Round 2: accommodate for use on smaller tonnage projects

Percent Within Limits (PWL) Pilots

- 2016 PWL
  - US 51 Marathon Co
  - STH 32 Calumet Co
  - STH 33 LaCrosse Co
- 2017 PWL
  - 19 Projects
    - 10 in NE Region

QMP Dispute Resolution

Quality Management Program (QMP)

- This program allows for product acceptance based on contractors' quality control (QC) testing when verified by the Department quality verification (QV) testing.
- Contractor assurance (CA) samples were a part of the QMP program until 2017

QV testing acceptance

- QV tests are run at the Regional lab for acceptance
  - Air Voids 2.0-4.3%
  - VMA within -0.5% of the min. required in Table 460-1
- If the mix is satisfactory, no additional testing needed until the next pre-established QV sample for the mixture is produced

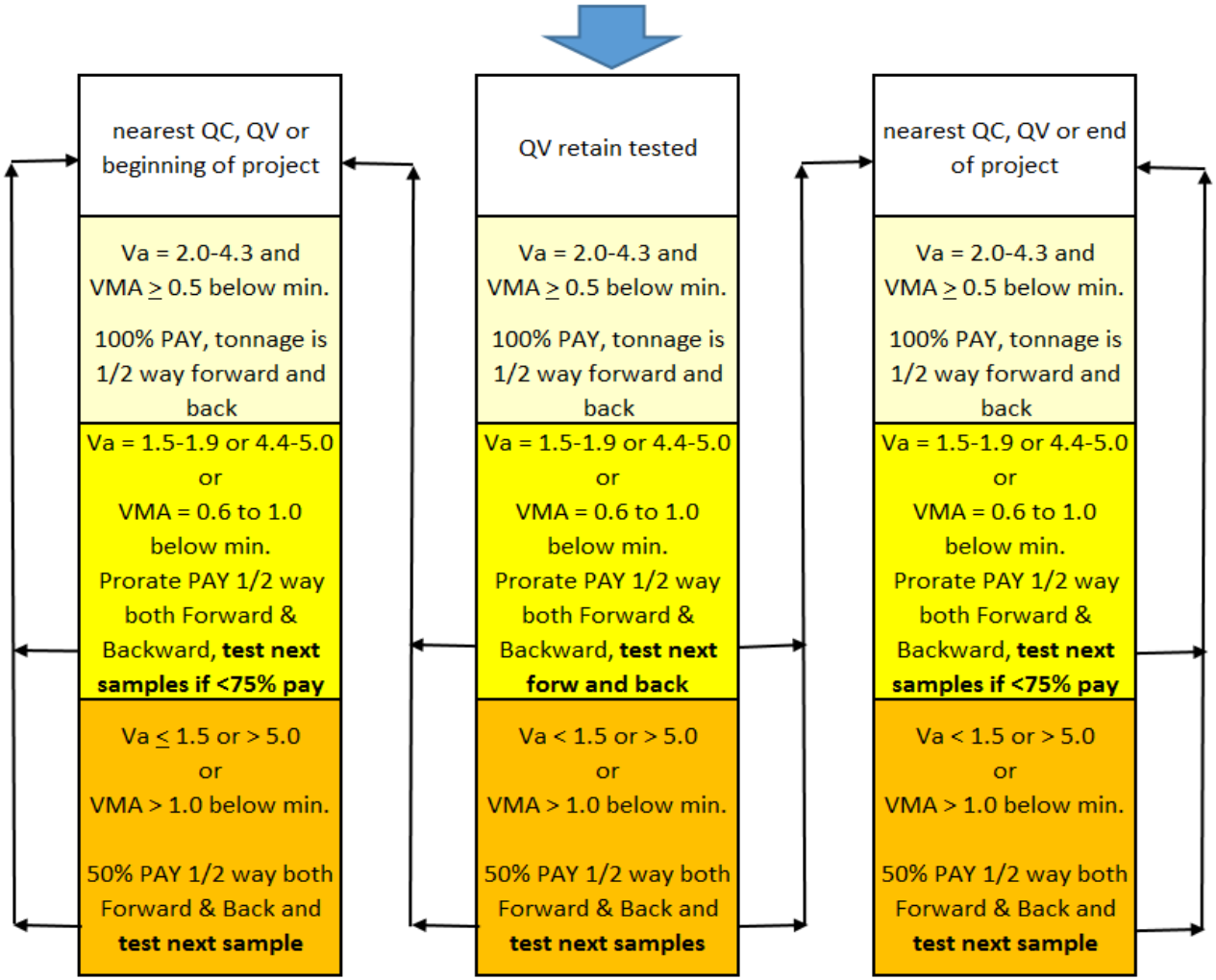
Dispute Resolution

- The BTS lab will determine if the mix is satisfactory or unsatisfactory
- If satisfactory, there are no payment adjustments
- If unsatisfactory, the QC-ret samples will be tested both forward and behind the QV sample until payment of 75% or more is achieved
- Tolerance testing is no longer looked at, just the range of acceptable air voids and VMA

Dispute Resolution

- There are no longer single truckload penalties, instead windows of material acceptability
- Instead a tiered system has been established based off of equations to determine the level of impact the unsatisfactory material will have on the project

Dispute Resolution Process



Tack Application Rates

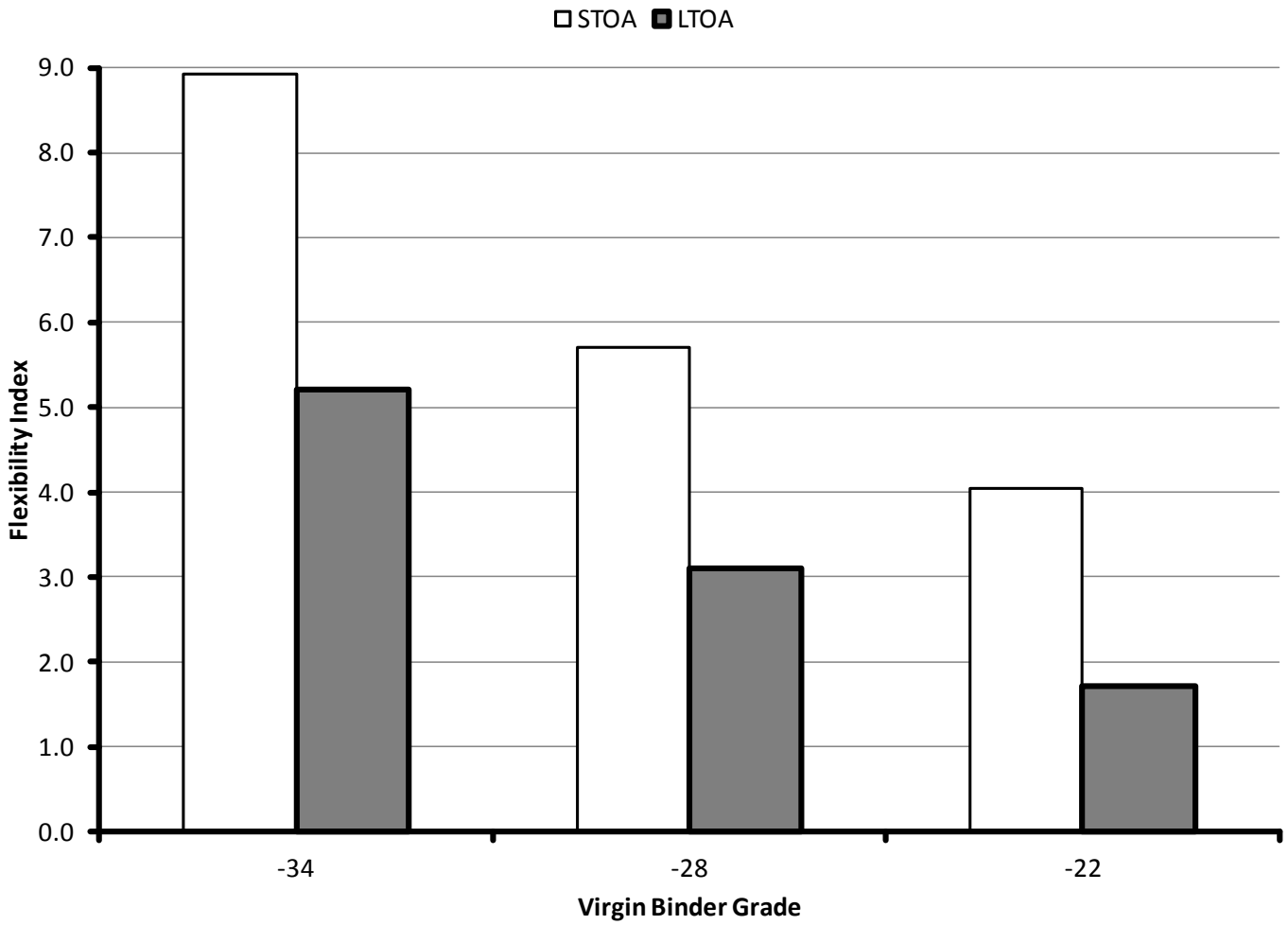
WHRP comes to the rescue!

- Pavement Durability – AAT (14-06) - Complete
- Pavement Performance Testing – UW-Madison (15-04) - Complete
- Joint Density Research – BME (15-09) - Complete
- Asphalt Binder Verification – NCAT (16-02) – In Progress
- Moisture Sensitivity – UW-Madison (17-04) - New
- Balanced Mix Design – NCAT (16-06) - New

Factors Affecting Asphalt Mixture Durability

General Category	Specific Factors
Environment	**Temperature** **Moisture**
Drainage	Surface Subsurface
Construction	**Weather Conditions** Segregation **Compaction** *Joints* **Layer Bond**
Mixture Composition	*Aggregate Properties* **Binder Properties** *Gradation* **Volumetric Properties**

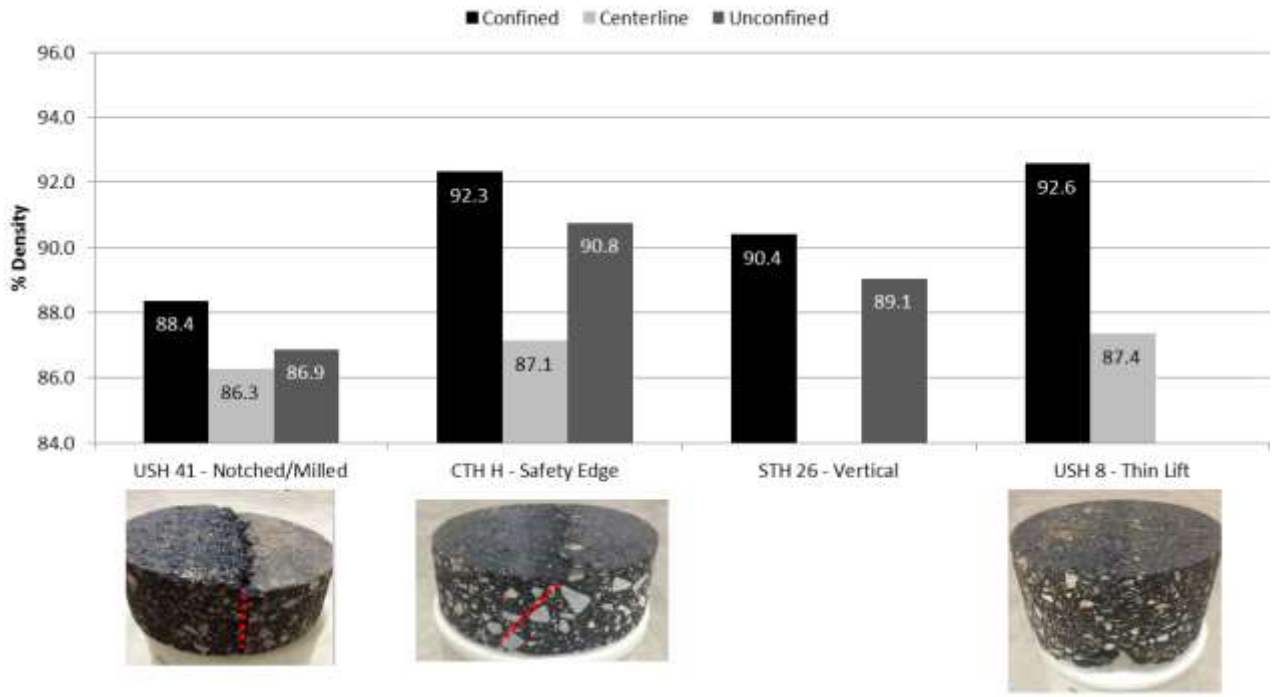
Cracking Resistance: Effect of Virgin Binder Low Grade



HMA Performance Testing

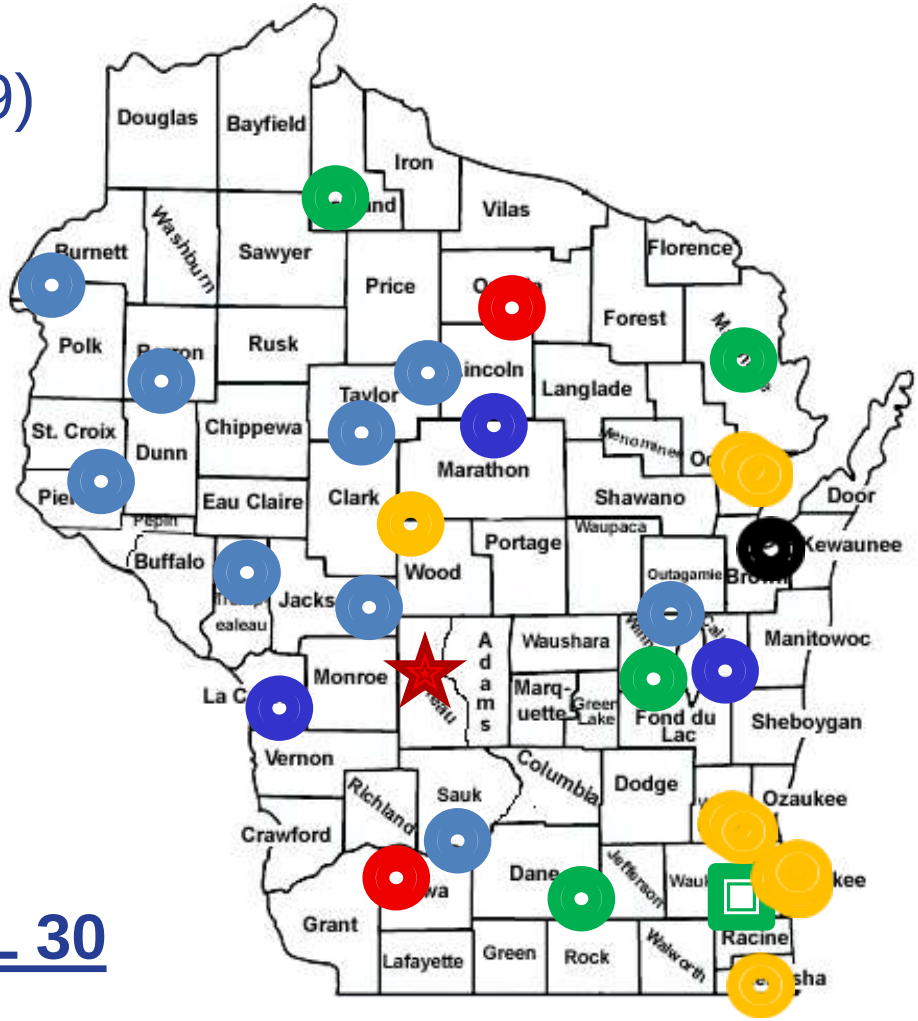
- WisDOT is currently conducting testing for:
  - Hamburg Wheel (Moisture Sensitivity & Rutting Potential)
  - Disc-shaped Compact Test (Low Temperature Cracking)
  - Semi-Circular Bend (Fatigue Cracking)
  - Ignition Oven (AC Content)

Longitudinal Joints



HMA Pilots Since 2013

- COLD IN-PLACE RECYCLE (9)
- HIGH RECYCLE WisDOT (4)
- HIGH RECYCLE NCHRP (1)
- PERCENT WITHIN LIMITS (3)
- FHWA DENSITY DEMO (1)
- REGRESSED AIR VOIDS (9)
- TEXAS UNDERSEAL (1)
- THIN OVERLAY (2) – **TOTAL 30**



Questions/Contact

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