Reduction in Number of Mixes Designs
Reduction in Number of Designs

- Eliminate
  - N105 Binder and Surface - IN PROGRESS
  - IL-12.5 Surface Mixes – IN PROGRESS
  - N30 “All Other Mixes” (i.e. 2% Voided BAM for stabilized sub-base and shoulders)
  - IL-19.0 Coarse Graded Mixes
- ABR & Percent of RAP / FRAP / RAS
  - Developed Committee to Address
HMA Fine Graded 19.0 Mix
Agreed at Joint HMA TWG to Abandon Coarse Graded IL-19.0 & go with Fine Graded IL-19.0

BMPR Revised BDE Special *Mixture Design Composition and Volumetric Requirements*

- Redefines our current IL-19.0 to be less coarse
- Eliminates reference to N105 & 12.5 *Surface* Mix
- Target November 2014 Letting as BDE
- BMPR Special until then
The focus is on Asphalt Binder Replacement and not on how much RAP/FRAP or RAS is incorporated.
PG Liquid Binder

Usage
PG Binder Used (in thousand tons)
Liquid AC Sampling at HMA Plants
## 2013 District PG INV Field Samples

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Potential PG Binder Changes

- Softer grades of PG binder
  - PG40-40, PG52-34
- Reintroduction of Recycled Engine Oil Bottoms (ReOB) to binder
  - Cost/Benefit, method of measurement
- Classification of binder using MSCR in lieu of PG testing
  - Grade to high temperature of location
  - Mix performance unknown
- Asphalt Binder Replacement (ABR) rejuvenators
Agg Issues

- Fine graded mixes creating too many fines.
Contractor Labs

- Round robin testing of Gmm, Gmb, Voids, unconditioned and conditioned tensile strengths with Z-score.
- AMRL may begin round robin testing of Hamburg Wheel in 2016.
Longitudinal Joint Issues
Failing PFP Edge Densities

- Rapid Penetrating Emulsion
  - Used on D1, D2 & D6 PFP projects
  - Guide will be developed for RPE
  - Proposed use of RPE would be as follows:
Effect of In-Place Voids on Life

Washington State DOT Study

[Graph showing the effect of in-situ air voids on percent service life. The graph indicates a decrease in percent service life as the compaction level increases from 89% to 100%.]
Effect of In-Place Voids on Life

Washington State DOT Study

In-situ Air Voids, %

Percent Service Life

Compaction Level

93% 92% 91% 90% 89%
Effect of In-Place Voids on Life

Washington State DOT Study

![Graph showing the relationship between In-situ Air Voids and Percent Service Life. The compaction level decreases from 93% to 89% as the In-situ Air Voids increase from 7% to 11%.]
Effect of In-Place Voids on Life

Washington State DOT Study

![Graph showing the relationship between in-situ air voids and percent service life. The graph indicates a decreasing trend as in-situ air voids increase. At 93% compaction, the percent service life is 93%. At 92% compaction, the percent service life is 92%. At 91% compaction, the percent service life is 91%. At 90% compaction, the percent service life is 90%. At 89% compaction, the percent service life is 89%.](image)
Effect of In-Place Voids on Life
Washington State DOT Study

Percent Service Life vs. In-situ Air Voids, %

- 93%
- 92%
- 91%
- 90%
- 89%

Compaction Level: 91%
Effect of In-Place Voids on Life

Washington State DOT Study

![Graph showing the effect of in-place voids on service life. The x-axis represents the in-situ air voids in percentage, ranging from 7% to 11%, while the y-axis represents the percent service life. The graph shows a decreasing trend in percent service life as the in-situ air voids increase. At an in-situ air void of 7%, the percent service life is 100%, and as the voids increase to 11%, the percent service life decreases to 89%. There are arrows indicating that a small increase in voids can result in a significant decrease in service life.](image-url)
Effect of In-Place Voids on Life

Washington State DOT Study

In-situ Air Voids, %

Percent Service Life

93% 92% 91% 90% 89%

Compaction Level
Effect of In-Place Voids on Life
Washington State DOT Study

In-situ Air Voids, %

Percent Service Life

93% 92% 91% 90% 89%

Compaction Level
Effect of In-Place Voids on Life

Washington State DOT Study

The graph shows the effect of in-place air voids on percent service life for different compaction levels.

- **In-situ Air Voids, %**
  - 7%
  - 8%
  - 9%
  - 10%
  - 11%

- **Percent Service Life**
  - 100%
  - 90%
  - 80%
  - 70%
  - 60%
  - 50%

At a compaction level of 90%, the percent service life is approximately 93%. As the compaction level decreases, the percent service life decreases as well.
Surface Mix – Erase Penalties If:

Figure 5. Field Permeability-Density Relationship for 9.5 mm NMAS Mixtures
Binder Mix – Erase Penalties If:

Figure 3. Field Permeability-Density Relationship for Project 11 (19.0 mm NMAS Mix)
Paver Segregation

- Anti-segregation kits
The Future of Longitudinal Joints ??

- Require Longitudinal Joint Seal for all C/L Joints Unless:
  1. Lift Paved Against a Confined Edge
     or
  1. Full Width or Echelon Paving (i.e. no C/L Joint)
     or
  2. Remove Low Density Mat’l from Unconfined Edge (i.e. Trim Off 6 inches)
Longitudinal Joint Seal 12 Yrs Later
Longitudinal Joint Seal 12 Yrs Later
Material Transfer Device
Proposed Specification
MTD w/ > 20 psi contact pressure not allowed on lower lifts of a full depth HMA pavement until 10 in. thickness in place.
Proposed Spec

- Require an MTD on all lifts of a Full Depth pavement.

- Only MTD’s with contact pressure \( \leq 25 \text{ psi} \) allowed on lower lifts where < 10 inches in place.

- Spec will be drafted & sent to BDE.
Tack Coat Spec Status
2013 Experience

- Not Enough Tack Coat being Applied
  - Jobs visited Tack Coat was \(<\frac{1}{2}\) the specified rate.

- Improper Cleaning
  - Vacuum Sweeper either not being used or
  - Wrong type of Vacuum Sweeper.
Still Not Enough
Better to error on high side for Bond Strength
Current Tack Coat Spec

- BMPR Special is on the Website
- Latest Revisions:
  - “Vacuum sweeping shall be accomplished with a regenerative air vacuum sweeper.”
  - “A bituminous prime coat shall be applied between each lift of HMA according to Article 406.05(b).”
  - “The regenerative air vacuum sweeper shall blast recirculated, filtered air through a vacuum head having a minimum width of 6.0 feet at a minimum rate of 20,000 cubic feet per minute.”
What’s Next?

- Monitor success of pavement cleaning with brooming and air blasting or sweeping.
- Test additional emulsions for applicability to rapid set.
- Monitor the use of “spray pavers”.
- Target 2015 as BDE Special.
- Correct terminology from Prime Coat to Tack Coat for next Spec Book.
Hamburg Wheel
Hamburg Spec

- Effective Nov. 2013 Letting – All mixes must pass Hamburg Wheel

HMA – Mixture Design Verification and Production
Hamburg Spec

- Production – A 300 ton Test Strip will be required at the beginning of HMA production
  - for each Mixture with 3000 tons or more
  - for each Contract
  - The 300 tons are excluded from pay adjustments on QCP and PFP. However, requirements of Section 406 still apply.
Hamburg Spec

- Required Hamburg Wheel Test (run by Dept). If Hamburg Test fails, production shall cease.
  - All prior produced material may be paved out, if other mix criteria met.
  - No additional mix produced until Engineer receives passing Hamburg Wheel test from Contractor.
2013 PFP Summary
## 2013 PFP Projects

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Nov 1, 2013
# 2013 PFP Projects

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2013 PFP Average Pay

- Binder = 98.6
- Surface = 99.5
- Overall = 99.1
Low Longitudinal Joint Density

- Numerous ½ mile sections had pay deducts according to PFP Pay Adjustment Table or required Remedial Action
- Most sections needing Remedial Action were treated with Rapid Penetrating Emulsion (RPE)
PFP Spec Revisions for 2014

- Editorial Cleanup
- Remove wording that PFP cannot be used on Shoulders
- PFP Spec Stable $\Delta$ will become a BDE Special for November Letting
2013 QCP Summary
2013 QCP Projects

- 31 Mixtures Completed
- 211,680 Tons
- Average Pay = 99.7%
- Range => 96.4% – 100%
- Department Tested 53.0% of Samples
QCP Spec Revisions for 2014

- Allow the subplot size to be adjusted by project.
- Revised Pay Document to allow yd\(^2\) pay item.
- Eliminate Dust/AC Precision Limit.
- Added footnote to Dust/AC Pay Table that District will test all 4 sublots if Dust/AC out-of-spec.
Local Agency Acceptance
Local Agency Acceptance

One Scenario
Quality Managed Plant (QMP)

• Specification
  • QA by Local Agency
  • Mix from a Qualified Plant
    • District splits samples once/month or 10,000 tons per plant
    • District monitors problems
    • District coordinates round robin testing
HMA Inspection Course (a.k.a. - RE Training)
One day course developed for & being taught in all Districts this spring

Targets PI (Materials & Construction) personnel

Emphasis on:
- PFP & QCP Duties
- Jobsite Sampling
- Longitudinal Joints
- New Tack Coat Spec
- Paver Segregation

Future of Course – department STTP class
HMA Toughness/Brittleness Test

- ICT project, Prof. Imad Al-Qadi
- Fatigue?
- Cold weather Thermal Cracking?
Future Challenges
Rubblizing and Full Depth HMA