59th Idaho Asphalt Conference

INCREASING SERVICE LIFE of HMA in WASHINGTON STATE

Joe DeVol, Asst. State Materials Engineer
October 24, 2019

Background

- How we got to where we are
  - Hamburg and IDT Specification - 2014
  - Multiple Stress Creep Recovery - 2018*
  - Included percent recovery - T 350 (R-92)
  - Worked with PCCAS, AI, Regional Task Group & WAPA

Pavement Management Perspective

- Mean = 17.2 years
- WW - Change of Life (years)
- Average Life (years) 16.2
- Annual Cost Per Lane-mile $25,648
- Change in Total Annual Cost $9,438,403

2017 - Met w/Industry Open Discussion and Dialogue

WSDOT

- Chris Christopher
- Jon Deffenbacher
- Kurt Williams
- Joe DeVol
- Jeff Uhlmeyer
- Bob Dyer

WAPA

- Dave Gent, WAPA
- Kenton Hill, Granite Construction
- Chris Pedersen, CTL
- Dave Bell, Lakeside Industries
- Brad Griffith, Miles Resources

* Worked with PCCAS, AI, Regional Task Group & WAPA

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Two Areas of Focus:

1) Increase Asphalt Content

2) Increase Density

1) Increase Asphalt Content

- Initial Discussions:
  - Add asphalt binder to all mixes (0.3% Pb)
  - Use air void regression (4.0% to 3.5% Va)
  - Revise voids in mineral aggregate (VMA) requirements
  - Tighten percent binder (Pb) tolerance
  - Tighter gradation control

VMA & Pb
SPECIFICATION REVISIONS

2017-2019 – 3/8 Inch VMA Production Data

2017-2019 – 1/2 Inch VMA Production Data
2017-2019 – 3/8 Inch Percent Binder (Pb) Production Data

2017-2019 – 1/2 Inch Percent Binder (Pb) Production Data

3/8 Inch HMA Percent Binder (Pb) Production Average

1/2 Inch HMA Percent Binder (Pb) Production Average

2) Increase Density

2017 COMPACTION SUBLOTS
LSL of 91% and Forecast with LSL of 92%
**COMPACTION SPECIFICATION**

- **2017**
  - **INCENTIVE**
    - LSL 91.0% Adj. Factor 0.4
  - **DISINCENTIVE**
    - LSL 91.0% Adj. Factor 0.4

- **2018**
  - **INCENTIVE**
    - LSL 91.5% Adj. Factor 0.8
  - **DISINCENTIVE**
    - LSL 91.5% Adj. Factor 0.6

- **2019**
  - **INCENTIVE**
    - LSL 92% Adj. Factor 1.0
  - **DISINCENTIVE**
    - LSL 91.5% Adj. Factor 0.6

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**2017-2019 – 3/8 Inch Compaction Production Data**

- **2017 Density Avg.** = 93.4%
- **2018 Density Avg.** = 93.8%
- **2019 Density Avg.** = 93.8%
- LSL = 91.0%

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**2017-2019 – 1/2 Inch Compaction Production Data**

- **2017 Density Avg.** = 93.7%
- **2018 Density Avg.** = 93.5%
- **2019 Density Avg.** = 94.1%
- LSL = 91.0%

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**2013 - 2019 HMA Percent Density Production Average**

- **3/8 Inch Percent Density**
- **1/2 Inch Percent Density**
What We Learned?

- Hamburg – 2010
  - Asphalt and Anti-Strip Compatibility
  - Asphalt Modification – Products and Processes
  - Benefits of Polymer Modification
  *Note: Dual testing AASHTO T 315 & T 350 since 2008

Hamburg Wheel Track Testing

Asphalt Binder Testing

Original Formulation
- Met Conventional PG Specs (AASHTO - M 320)
- Met MSCR Specs * (AASHTO - M 332)
- Elastic Recovery = 25% (AASHTO - T 301)
  *Excluding R 92

Polymer Modified
- Met Conventional PG Specs (AASHTO - M 320)
- Met MSCR Specs ** (AASHTO - M 332)
- Elastic Recovery = 74% (AASHTO - T 301)
**Including R 92
2018 Standard Specifications
Asphalt Binder Changes

- M 320 Grading System
  - PG58-22
  - PG64-22
  - PG70-22 (60% ER)
  - PG64-28 (60% ER)
  - PG70-28 (60% ER)
- M 332 Grading System
  - PG58S-22*
  - PG58H-22
  - PG58V-22 (30% Rec)
  - PG64S-28* (20% Rec)
  - PG64H-28 (25% Rec)
  - PG64V-28 (30% Rec)

* "S" Grade not used by WSDOT

9-02.1(4) Performance Graded (PG) Asphalt Binder

PG asphalt binder meeting the requirements of AASHTO M 332 Table 1 of the grades specified in the Contract shall be used in the production of HMA. For HMA with greater than 20 percent RAP by total weight of HMA or any amount of RAS the new asphalt binder, recycling agent and recovered asphalt (RAP and/or RAS) when blended in the proportions of the mix design shall meet the PG asphalt binder requirements of AASHTO M 332 Table 1 for the grade of asphalt binder specified by the Contract.

In addition to AASHTO M 332 Table 1 specification requirements, PG asphalt binders shall meet the following requirements:

- 

Additional Requirements for Performance Graded (PG) Asphalt Binders

<table>
<thead>
<tr>
<th>Property</th>
<th>Test Method</th>
<th>PG58B-22</th>
<th>PG64B-22</th>
<th>PG58H-22</th>
<th>PG64H-22</th>
<th>PG58V-22</th>
<th>PG64V-22</th>
<th>PG64S-28</th>
<th>PG64H-28</th>
<th>PG64V-28</th>
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<tr>
<td>Viscosity</td>
<td>AASHTO T 230°</td>
<td>500 Pa·s</td>
<td>400 Pa·s</td>
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<td>500 Pa·s</td>
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<tr>
<td>Recovery</td>
<td>AASHTO T 331°</td>
<td>90% Min</td>
<td>90% Min</td>
<td>90% Min</td>
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*Specimen conditioned in accordance with AASHTO T 450 – 070.

The RTFID test and the MWD direct tension specifications of M 332 are not required.
### 2018 Asphalt Binder Meeting Specification

<table>
<thead>
<tr>
<th>Year</th>
<th>Percent Asphalt Binders Meeting Specifications</th>
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<tbody>
<tr>
<td>2018</td>
<td>97.2%</td>
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#### Questions?

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