POLYPHOSPHORIC ACID (PPA) MODIFICATION in ASPHALT BINDERS
DOT PERSPECTIVE

2008 AGENCY SURVEY (AASHTO) USUAGE /SPECIFICATION
WHY MIGHT THIS BE IMPORTANT?

(AMAP Survey / February 2009)

- 65% must be Modified to Meet Specification
- 44% specify for Modification
- 40% Specify Type of Modifier
- 18% Specify Percent of Modifier
- 62% of All 50 States have *Plus* Specs
- 25% of Binder reported was Modified
How Have Things Changed?
(AMAP Survey / February 2009)

• Volatility – both in pricing and supply - is here to stay

• Predictability is and will remain poor

• Producers are more likely to avoid overdependence in one product
PURPOSE (GOALS)

• PROVIDE CURRENT STATUS of USE
• IDENTIFY ANY CONCERNS
• DETERMINE CRITICAL GAPS in KNOWLEDGE
• DEVELOP POTENTIAL DATABASE for PERFORMANCE HISTORY / DOCUMENTATION
• DETERMINE WORKSHOP INTEREST
SURVEY FORMAT

• AASHTO LIST (All U.S. & M.T.O.)
• NINE (9) QUESTIONS
  – Short answer
  – Progressive
“THE QUESTIONS”

1. Do specs *actually address* PPA?
2. *If allowed*; do you restrict in any way?
3. What binder grades have been used?
4. Documented / tracked performance?
5. *If yes*; do you have any reports?
6. *If not allowed*; why?
7. D.Y.K.; FHWA study (Risk/Benefit)?
8. D.Y.K.; FHWA study (PPA/SBS)?
9. Interest in National PPA Workshop?
SUMMARY of RESPONSES
(The Answers)
TOTAL RESPONSE to SURVEY
(37 Responses) 73%

Map showing states with replies and no replies.
Do Specs Address PPA / Any Restrictions (Questions #1 & 2)

- Don’t Allow (*Directly / Indirectly*) - 22%
  - (AL, AR, CO, GA, IA, KY, MD, SD)
- Don’t Address (*But indirectly restrict / prohibit*) - 16%
  - (ID*, LA, NC, NJ, TX, UT)
- Allow (*Directly / Indirectly - Unrestricted*) - 22%
  - (CT, ME, MI, MN, MT, NH, NV, OH)
- Allow (*With restrictions*) - 13%
  - (NY*, PA*, SC*, WY*, MTO)
- Don’t Address (*But indirectly allow / neutral*) - 27%
  - (AZ, DE, FL, IN, MO, OR, TN, VA, WA, WV)
BUT WAIT A MINUITE !
TOTAL RESPONSE BOTH SURVEYS
(48 Responses) 94%

Includes 2007 MTO SURVEY
Do Specs Address PPA / Any Restrictions (Questions #1 & 2)

**Includes 2007 MTO SURVEY**

- **Don’t Allow** *(Directly / Indirectly)* - 31% (22%)
  - (AK**, AL, AR, CA**, CO, GA, HI**, IL**, IA, KY, MD, MS**, NE**, SD, TN**)  

- **Don’t Address** *(But indirectly restrict / prohibit)* – 19% (16%)
  - (FL, ID*, KS**, LA, NC, NJ, OK**, TX, UT)

- **Allow** *(Directly / Indirectly - Unrestricted)* – 25% (22%)
  - (AZ**, CT, ME, MI, MN, MT, NH, NM**, NV, OH, RI**, VT**)

- **Allow** *(With restrictions)* – 10% (13%)
  - (NY*, PA*, SC*, WY*, MTO)

- **Don’t Address** *(But indirectly allow / neutral)* – 15% (27%)
  - (DE, IN, MO, OR, VA, WA, WV)
PPA Specification / Use (48 Responses)

- **Allow**
- **Don’t Allow**
- **Restrict**
- **Neutral**
- **No Response**
Summary of Direct / Indirect Restrictions
(Question #2)

• Mostly “Plus” Specifications (Polymers)
  – LA – (FD & ER Requirements)
  – NJ & TX – (ER Requirements)
  – NC – (With Polymers Only)
  – UT – (PA, ER, DT & HWT)

• Others
  – NY – Not with Limestone (Northern Region)
  – PA – Experimentally only (PG 64-28)
  – SC – Recently Due to SBS Shortage
  – WY – Max. 0.5% PPA (1900 ppm)
  – MTO – Max. 0.5% w/polymer & 1% all others
Distribution of Binder Grades
Modified w/ PPA
(Question #3)

- 4.5% PG 64-22 - LA(?)
- 9% PG 76-22 - NJ(?), NC(?)
- 41% PG 64-28 - CT, ME, MT, NH, NY, OH, PA, WY, MT
- 14% PG 70-22 - NY, NC, SC
- 18% PG 70-28 - MT, UT, WY, MTO
- 4.5% PG 58-34 - MN
- 9% PG 64-34 - MN, UT
<table>
<thead>
<tr>
<th>Year</th>
<th>Binder Composition</th>
<th>Modified Percentage</th>
</tr>
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<tbody>
<tr>
<td>2008</td>
<td>75% PG 64-22</td>
<td>35% are Modified</td>
</tr>
<tr>
<td></td>
<td>57% PG 76-22</td>
<td>100% are Modified</td>
</tr>
<tr>
<td></td>
<td>57% PG 64-28</td>
<td>91% are Modified</td>
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<tr>
<td></td>
<td>39% PG 58-28</td>
<td>65% are Modified</td>
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<tr>
<td></td>
<td>39% PG 70-22</td>
<td>96% are Modified</td>
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<tr>
<td></td>
<td>30% PG 70-28</td>
<td>100% are Modified</td>
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<tr>
<td></td>
<td>18% PG 58-22</td>
<td>87% are Modified</td>
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<td>13% PG 76-28</td>
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</tbody>
</table>
Documentation / Tracking (Question #4)

- CT – Gen. observe (Vol., Place & Compact)
- ME – Monitoring T.S. (58-28 w/o & 64-28 w)
- MN – MnROAD T.S. 2007 (Workshop)
- MT – New Lab study (PPA?, HWT vs. PPA(x))
- NV – Current project (Modified vs. Unmodified)
  More planned ‘09 – Lab tests / Performance)
- UT – Recent Binder Studies – MSCR (w/SBS
  “reasonable qty” enhance some mixes)
- MTO – Attempting now (Required Rpt. ’07)
Available Reports
(Question #5)

• NONE CURRENTLY

However

• WORKSHOP PRESENTATIONS
  – AR – “Arkansas Rubbleization Program”
  – MN – “MnRoad Test Sections”
  – UT – “Utah Trials”

• PREVIOUS PRESENTATIONS

• “WISH LIST” (Documentation)
  – ME, MT, NE*, NY*, NV, PA, WY
REASONS for NOT USING or RESTRICTING PPA
(Question #6)

- Like / Prefer Polymers – AL, KY, MD, PA, SD
- Possible Adverse Reaction w/ HL, LS, LA (Moisture Damage) – GA, IA, KY, NY, PA, SC
- Unknown Long-Term Performance – AR, KY, PA
- Negative Reports By Others – CO, ID, (WY’04-’06)
- Binder Recovery Concerns - SC
AWARE of FHWA STUDIES (Questions #7&8)

- **T/F (PPA Risk/Benefits)**
  - 25 States thought they heard about study
  - 11 States did not know

- **FHWA (Co-modifier)**
  - 20 States thought they heard about study
  - 16 States did not know
Interest in Attending Workshop (Question # 9)

• Strong Support
  – 31 ”Yes”
  – 2 “Not sure”
  – 3 “No”

• Travel Restrictions Significant Concern
  – 55%(17/31)
Survey Conclusions / Observations

• No clear consensus or majority on the reported use or restriction of use of PPA  
  However  
  (May be some regional bias (SE→ MW)

• Among concerns identified are:
  1. Inferior quality of modification compared to polymers (elastomerics).
  2. Potential for improper dosing or unexpected reactions.
  3. Potential for adverse reactions, including; modification reversal w/ HL,LS,LA→PD / MD.
  4. Binder recovery issues leading to improper grade determination.
Survey Conclusions / Observations (cont.)

• A potential exists to significantly expand the currently limited performance database & available documentation on PPA as a binder modifier.

• Due to fluctuating Binder / Modifier supply, agencies will need to be more flexible & knowledgeable concerning modifiers.

• Workshop agenda should go a long way toward filling critical gaps in knowledge on PPA modification.
THANK YOU!

QUESTIONS?