

KS DOT Binder Specs

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Presentation Layout

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 - Test Method
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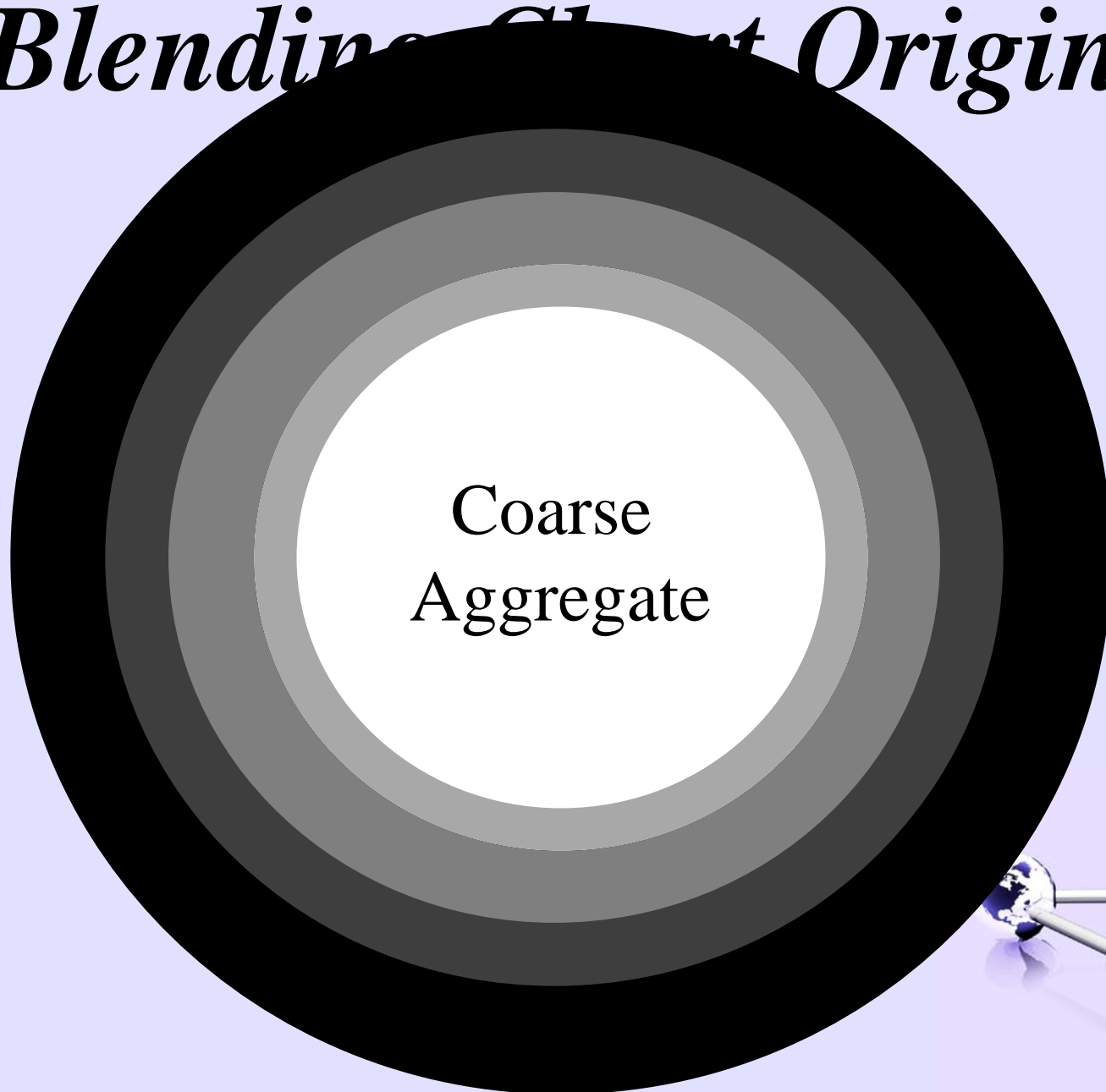
Blending Chart Origin

NCHRP 452 –'01: Recommended
Use of Reclaimed Asphalt Pavement
in the Superpave Mix Design
Method: Technician's Manual

Author: Becky McDaniel
Purdue University (NCSC)



Blending at Origin



Blending Chart Origin

Issues involving “RAP Fines”

- *Includes higher % aged binder*
- *Ages virgin binder*



Blending Chart Origin

Issues involving “RAP Fines”

- *Higher content of binder*
 - *Dust/Binder Ratio*
 - *Bag House Fines*
- *More Variable*



Blending Chart Origin

Contractor Needs to Consider Fractionating the RAP (FRAP)...

- *Greater control of RAP*
 - *More uniform product*
 - *Easier to adjust*
 - *Optimize Plant Production*



Blending Chart Origin

Theoretical Calculation of Blended Temperature Effect

$$T_{\text{blend}} = \frac{\% \text{RAP}}{100} (T_{\text{RAP}} - T_{\text{virgin}}) + T_{\text{virgin}}$$



Blending Chart

KDOT BLENDING CHART CALCULATION

Version Date: 9/1/10

Project Number		
RAP & Virgin Binder Inputs		
Temperatures	PG _{upper}	PG _{lower}
PG _{RAP}		
PG _{virgin}		

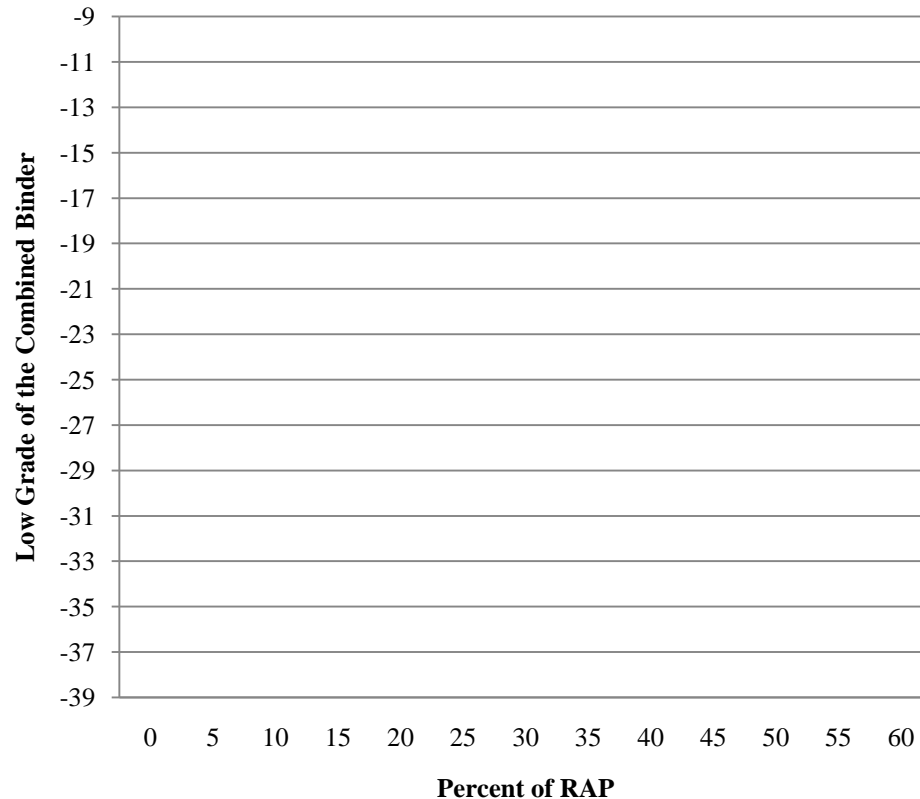
RAP Percent in Mix Design*		
Blended Low Grade of Binder:		

* If utilizing FRAP insert total FRAP percent (coarse and fine) in Mix Design

Blending Chart Calculations

%RAP	PG _{blend} =
0.00	
5.00	
10.00	
15.00	
20.00	
25.00	
30.00	
35.00	
40.00	
45.00	
50.00	
55.00	
60.00	

Low Side Blending Chart

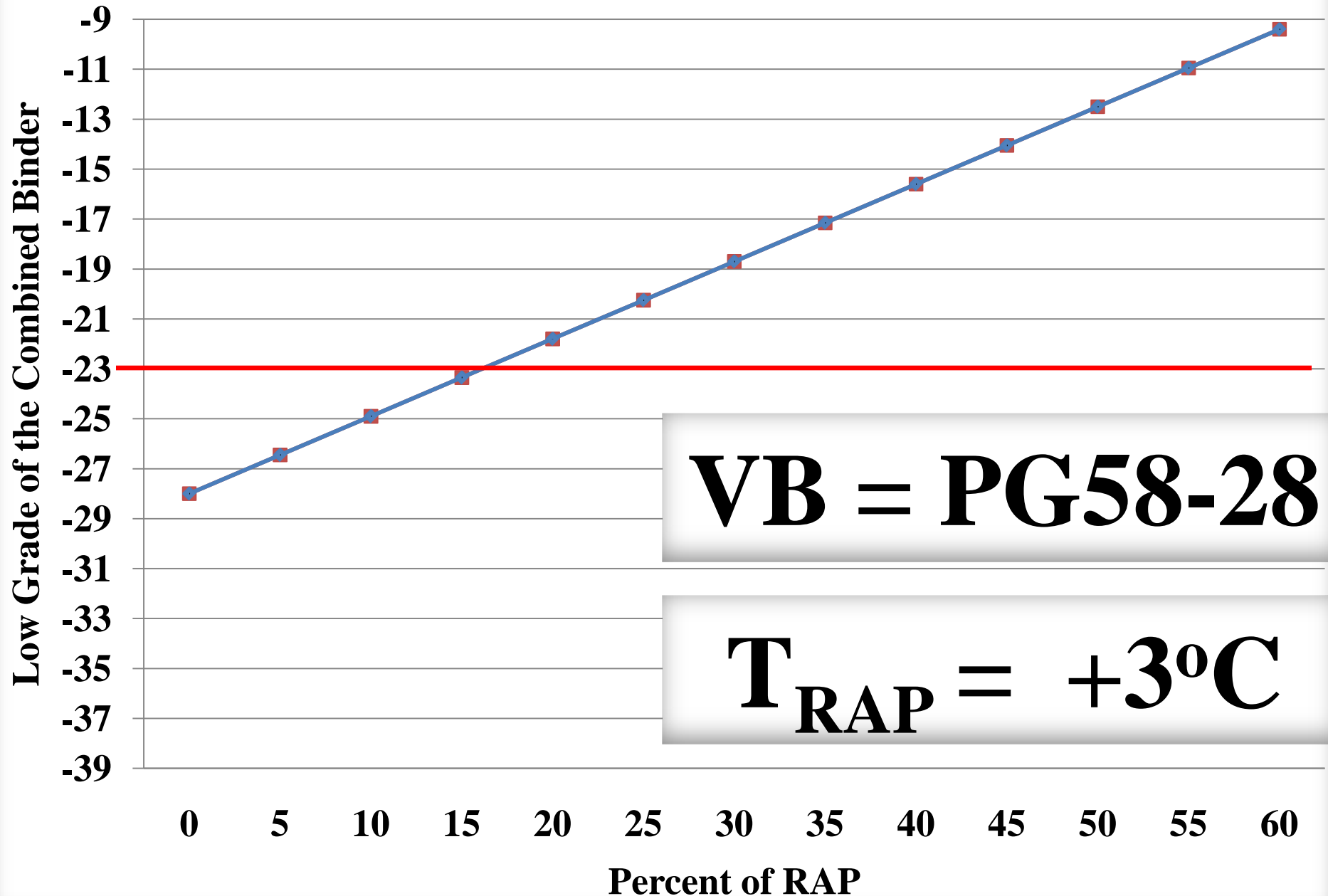


Blending Chart

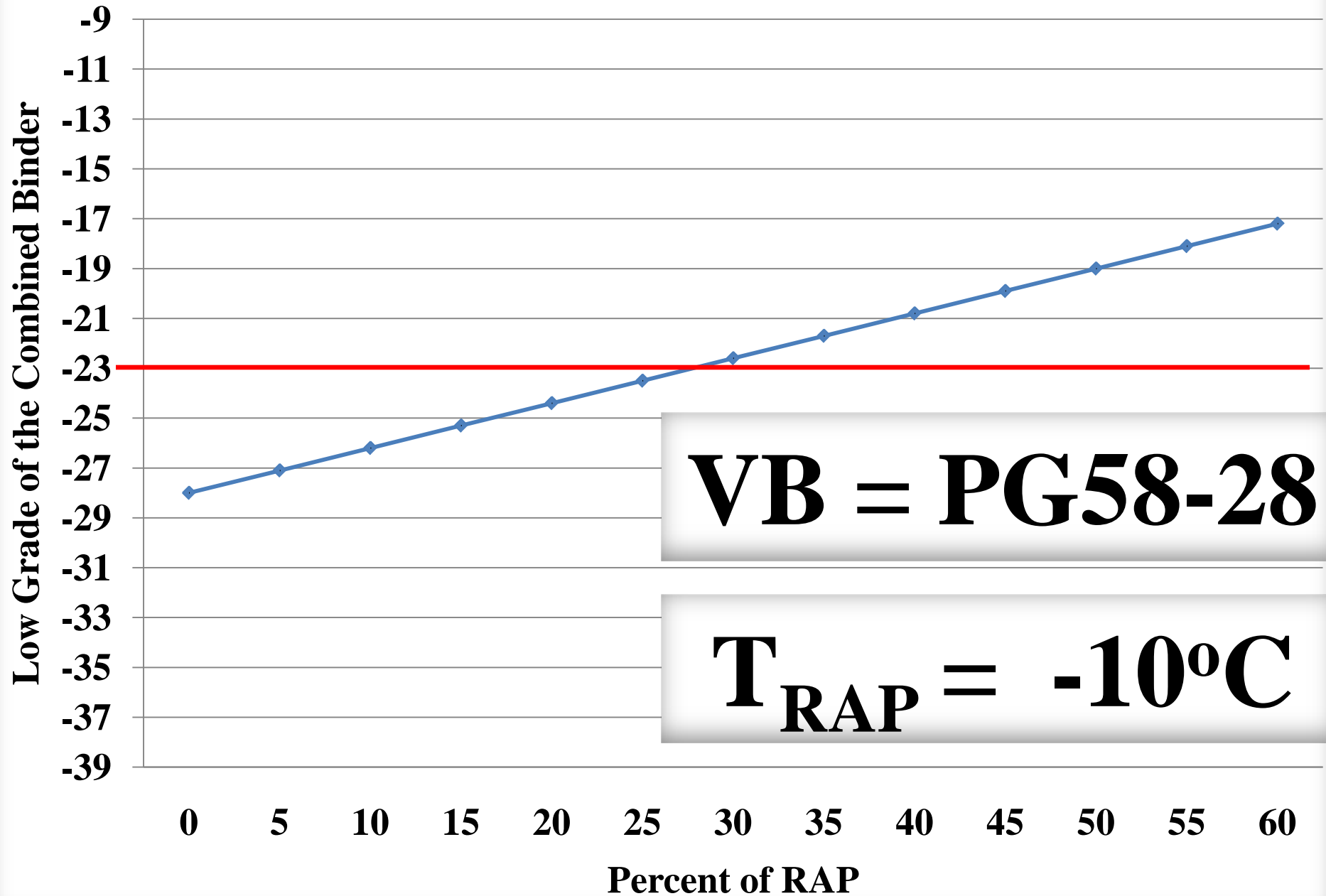
Project Number		
RAP & Virgin Binder Inputs		
Temperatures	PG _{upper}	PG _{lower}
PG _{RAP}	84	3
PG _{virgin}	58	-28
RAP Percent in Mix Design*		25.0
Blended Low Grade of Binder:		-20
Low Binder Grade Does Not Meet Spec		
* If utilizing FRAP insert total FRAP percent (coarse and fine) in Mix Design		



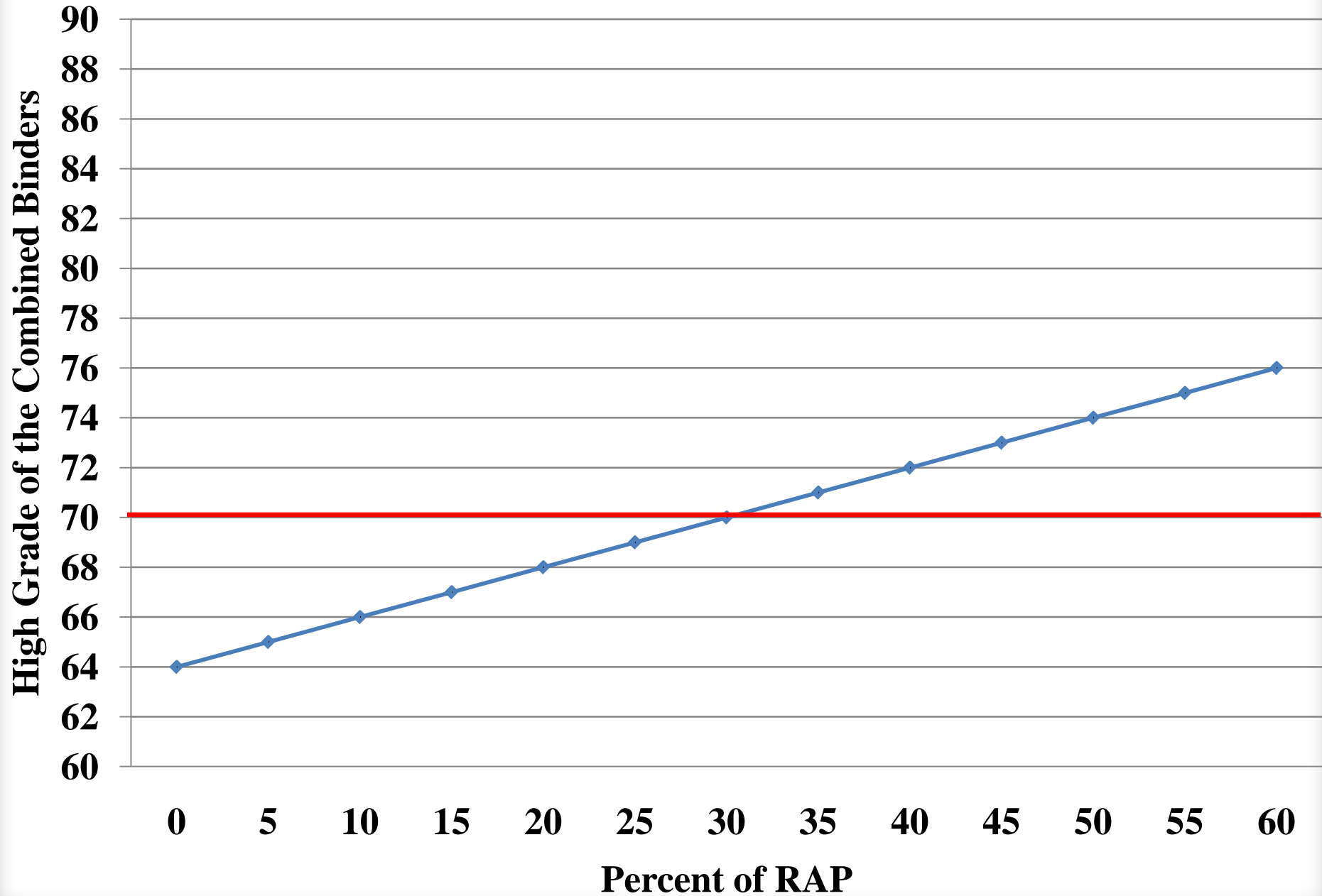
Low Side Blending Chart



Low Side Blending Chart



High Side Blending Chart



KDOT's Goal

- Promote Competitive Use of Binders
- Minimize Risk from RAP Binder
- Encourage FRAP Process
- Greater Use of RAP



Tack Bond Strength

- Test Method
- BMPs
-
- Specification



Draft KT-78

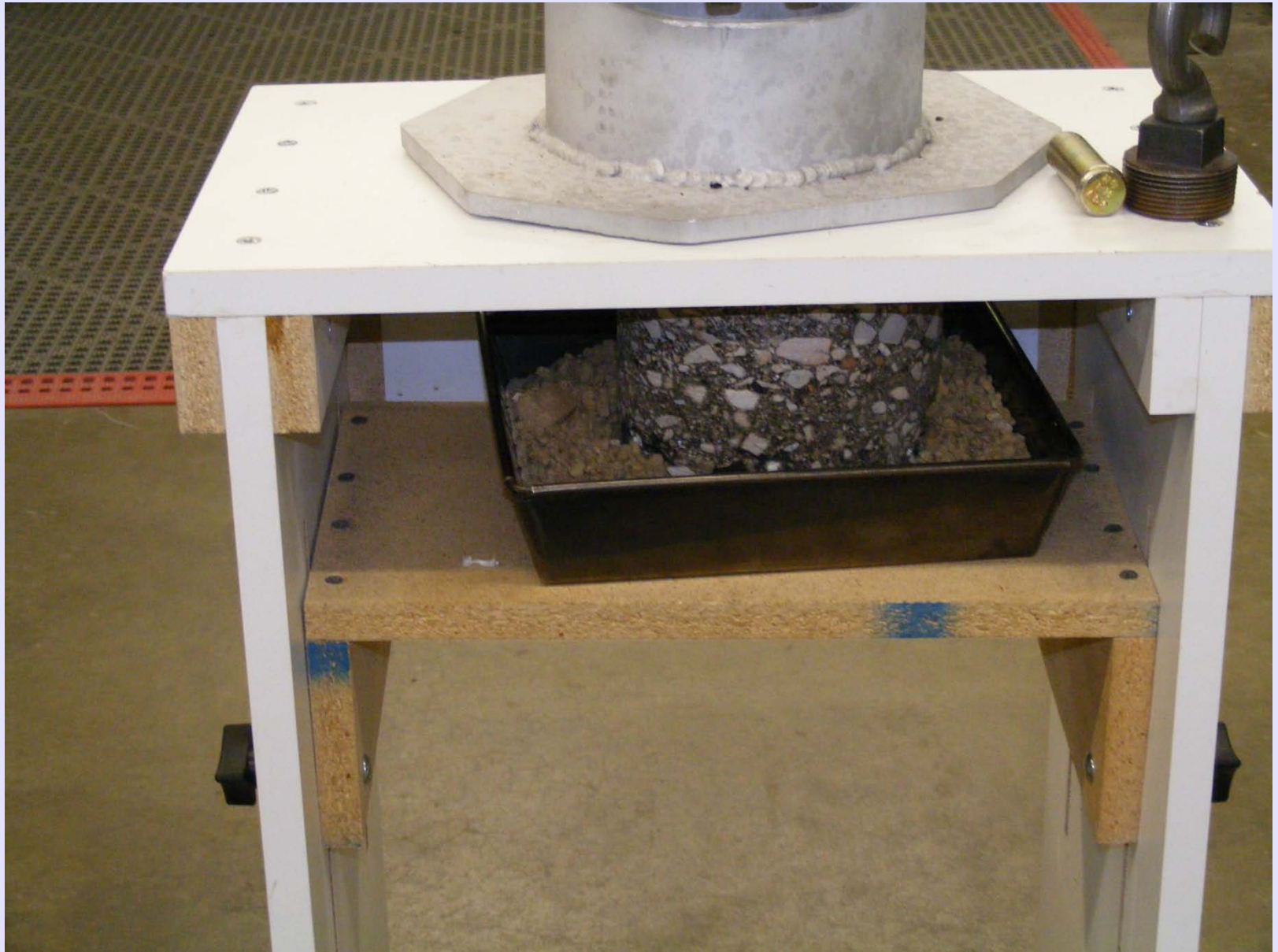
- KT-78 “Method for Determining the Tensile Adhesive Strength of Asphalt Pavement Tack Coat”













Best Management Practices (BMPs)

- Preparation
- Storage/Handling
- Distributor
- Spraypaver
- Application
- Special Considerations
- Asphalt Emulsion Supplier

BMPs: Preparation

- *Consult with the emulsion supplier* with respect to a particular asphalt-aggregate combination...
- *Understand condition* (previous use) of delivery *tankers* and steps taken to minimize risk of contamination to the asphalt emulsion.
- *Remove* accumulated *dust and dirt* by mechanical brooming or by flushing with air and/or water.

BMPs: Storage/Handling

- *Prevent contamination* by water, oils or other liquids.
- Prevent contamination by other incompatible emulsions.
- *Protect from freezing and boiling temperatures* that break the emulsion and cause separation into asphalt and water.

BMPs: Storage/Handling

- If water is added by contractor, then water is to be clean, potable water, free from detectable solids or incompatible soluble salts... No instability or coagulation should appear.
- Protect from local overheating caused by high temperature heating coils and surface heating pads...

BMPs: Storage/Handling

- *Use bottom loading* wherever possible or employ full-length drop hose to eliminate foaming...
- *Allow surface crust* that may form on emulsion in storage *to float without disturbance*...
- *Reduce high shear* that can break emulsions by enlarging clearances on new gear pumps by milling if necessary.

BMPs: Storage/Handling

- *Prevent unnecessary circulation* that can cause drop in emulsion viscosity and emulsion instability.
- *Do not agitate emulsion with forced air* as it may cause the emulsion to break.

BMPs: Distributor

- Review appropriate maintenance practices of distributor with driver.
- Apply tack by a pressure distributor.
- All nozzles on the distributor are open and functioning.

BMPs: Distributor

- Nozzles are turned at the same angle to the spray bar; approximately 30°, depending on the manufacturer of the distributor.
- Proper height above the pavement surface provides a double or triple lap of the liquid asphalt material.

BMPs: Distributor

- *Distributor heats* the asphalt emulsion to the *proper temperature* so that it is fluid enough to be sprayed from the nozzles; not coming out in strings.

BMPs:Spraypaver

- Coming soon!

BMPs:Application

- *Proper asphalt emulsion is used; material adheres to the old surface.*
- *Correct amount of tack coat is sprayed* on the surface, so some of the existing surface will still be visible through the tack coat—not all of the existing pavement surface will be covered with the tack coat...

BMPs:Application

- The proper tack coat application will leave residual asphalt cement content of approximately 0.04 to 0.06 gal/yd² on the roadway.
 - An open-textured surface requires more tack coat than a surface that is tight or one that is “fat” or flushed.
 - More tack coat material may be needed on a milled surface because of the increased surface area. In the last case, the application rate could be as great as 0.08 gal/yd² of residual asphalt cement.

BMPs:Application

- The emulsion must break (change color from brown to black) and the water must evaporate from the emulsion before the new mix can be placed over the tack coat material.
- If the overlay is to be constructed under traffic, the tack coat is normally placed only a short distance in front of the paver;...

BMPs: Special Considerations

- Do not dilute rapid setting (RS) emulsions with water.

BMPs: Asphalt Emulsion Supplier

Variables that may be causing issues are, but not limited to, the following:

- *Ionic charge* on the asphalt emulsion
- Type and concentration of the emulsifying agent
- Addition of chemical modifiers

BMPs: Asphalt Emulsion Supplier

Variables that may be causing issues are, but not limited to, the following:

- Asphalt particle size in the emulsion
- Hardness and quantity of the base asphalt cement
- Chemical properties of the base asphalt cement
- Manufacturing variables

BMPs

NOTE: Most of the list is derived from

- Hot-mix Asphalt Paving Handbook
(AASHTO/FAA/FHWA/NAPA/US Corp)
- A Basic Emulsion Manual (Asphalt Institute)
- Performance Guidelines, Section 11(AEMA)

Bond Strength Specification

- *Tack Emulsion paid by the square yard*
 - Type and Quantity determined by contractor
 - Minimum application rates
- Obtain cores the same day as placement of material
- Lot will consist of a day's placement
 - Two Longitudinal locations per Lot

Bond Strength Specification

**TABLE 602-19: BOND STRENGTH
REQUIREMENTS**

Mix Designation	Tensile Stress Range (psi)	Test Result
All	≥ 70	Pass
All	50 - 69	Follow BMP
All	35 – 49	Suspend Plant Production and paving
All	< 35	<i>5% on 1st failure</i> <i>10% any additional failure</i>

MSCR Test within KsDOT

- Prequalification
 - *“[KDOT] will add the [MSCR] Test (AASHTO TP 70) when prequalifying all PGAB samples with a PG 70 or higher designation...”*
- Verification
 - *“We will also periodically test the MSCR of verification samples of products that will remain on the list for next year.”*

MSCR Test within KsDOT

- *“...At this time, the MSCR will not be part of our specification, but simply a way for us to begin to understand the variability of MSCR testing and build a history for our producers.”*

Karen Shufflebarger

(email sent 12-6-2010)

Thank you!

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