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#### Timeline



### In the beginning...



#### **1988 Test Section**

- "MP 52" on I-40 in Haywood Cty.
- Problem Area- HMA, on PCCP with base problems, was rutting
- "...they took out the sticky stuff..." (viscosity grade AC-20)
- 1 mile test section with ELF SBS- increased film thickness and got the sticky back



## Experimental Projects, 1989 and 1990

- I-40 MP-119 to 129- Henderson, Carroll, and Decatur Counties
  - Evaluated Styrelf/ELF SBS polymer
- I-81 MP 50.5- 57.5- Greene, Sullivan, and Washington Counties
  - Evaluated Ultrapave latex modifier



### **1989- Specification** LATEX

 Asphalt cement shall be modified by the addition of 3% latex solids

		<u>Anionic</u>	Cationic
•	Styrene/butadine ratio	24/76 ± 1.5 %	
•	Solids	67% min.	60% min.
•	рН	10 ± 0.5	6.2 max.

- Initially Latex was pumped directly into the pugmill and balled up,
- introduced into another container and prior to pugmill and balling was minimized

# 1989- Specification SBS

#### Base asphalt shall be AC-20

• Viscosity ratio 2.5

(Absolute viscosity at 140°F)

- Viscosity at 275° (min.) 500
- Penetration 45-70
- Ring and Ball 130 °F
- Elastic Recovery (min.) 58%





# 1993 Specification "Light" and "Heavy"

	Base asphalt shall be AC-20			
		Heavy	Light	
•	Viscosity ratio (Absolute viscosity at 140°F)	2.5	1.5	
	Viscosity, P	6000		
	Viscosity at 275° (min.)	500	400	
	Penetration	45-70	50-75	
	Ring and Ball	130 °F	120 °F	
	Elastic Recovery (min.)	58%	40%	

# **1998-Performance Grade specification**

- Adopted SHRP Performance Grade Specification
  - PG 64-22
  - PG 76-22 +
    - Base Asphalt shall be 64-22
    - Modified with SB, SBS, or SBR
    - Elastic Recovery 58%
    - Ring and Ball 135° F
    - Screen test
      No lumps



# **TDOT Policy- 2000**

- PG 64-22 All roads less than 10,000 ADT
- PG 70-22 All roads greater than 10,000 ADT
- PG 76-22 All Interstates and roads with heavy truck traffic
- PG 82-22 Some urban TDOT Interstates (2001)

# **2000- PG Plus**



	Elastic Recovery, %	Ring and Ball, °F
PG 64-22	N/A	N/A
PG 70-22*	40	128
PG 76-22*	58	135
PG 82-22*	70	150

\*Base Asphalt PG 64-22, shall be modified with SB, SBS, or SBR



# Elastic Recovery at 50°F or 77°F



#### Rotational Viscosity (Brookfield)



#### Phase Angle vs. PG grade



### Special Provision 407SGC

- Using Compaction study and APA data developed SP 407 SGC
- 4 projects/ 1 per region- July 25, 2003 letting
- Mixture design with SGC at 65 gyrations and APA performance



## Special Provision 407SGC, cont...



- Specification Requirements:
- ADT <10,000
  - max. rut 0.40 in.
- ADT >10,000
  - max. rut 0.35 in.
- Did NOT change any aggregate requirements



PG 64-22 Rut Depths at 4,000 & 8,000 Cycles



◆ 4,000 Cycles ■ 8,000 Cycles



PG 70-22)s. APA Cycles



◆ 4,000 Cycles ■ 8,000 Cycles



PG 76-22 vs. APA Cycles



◆ 4,000 Cycles ■ 8,000 Cycles



#### **APA rut depths**



### In Summary...

- TDOT has seen the benefit of modified binders since 1988
- "the sticky stuff is back"
- Improved rut resistance
- Improved film thickness



#### End with a bang....

