


Asphalt Binder (and Emulsion) Training and Certification


Mike Anderson, Asphalt Institute

SEAUPG Annual Meeting
November 19-21, 2024
Mobile, AL

Building Roads in the 1980's with 1920's Technology



IH-35 near
Wichita, KS (1986)



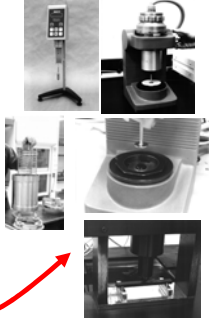
IH-10 near
Winnie, TX (1981)

Acknowledgments

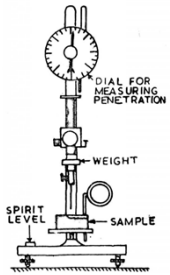
- Content
 - Bob McGennis, HF Sinclair
 - Mike Beavin, Asphalt Institute
 - Karl Zipf, Delaware DOT (ret.)
 - Pavel Kriz, Imperial Oil/ExxonMobil
- Asphalt Institute's Member Companies

Which Led To:


- Surface Transportation and Uniform Relocation Assistance Act (1987), Section 128
- Strategic Highway Research Program
 - 1987-1993
 - \$50 million asphalt research project funded by state DOTs (0.1% of Federal \$ Allocation)
 - conducted primarily at universities
- Product was called Superpave
 - Superior Performing Asphalt Pavements
 - Performance Grade binder spec with new tests
 - mix design system



A Little History




➔



What Came Next?

- FHWA assumed lead implementation role
- Demonstration Project 101: National Asphalt Training Center (1992 – 1998)
 - The Team
 - Asphalt Institute (Lead)
 - Pennsylvania State University
 - University of Texas at Austin
 - Marathon Oil Company
 - NCAT
- NATC Goal – "...nationally accessible training center aimed at educating both agency and industry personnel in proper use and... application of Superpave."

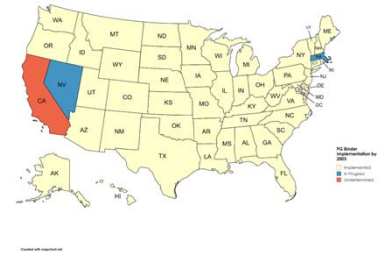
The Beginning

- Performance Graded (PG) system developed during SHRP program in early 90s
 - Shortly after SHRP ended in 1993, Bob McGennis managed a team to develop technical training materials as part of an FHWA project coined the "National Asphalt Training Center" (NATC)



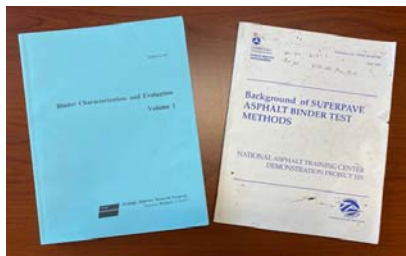
The Beginning

- By 1997, two thirds of states had adopted the PG system
 - Steep learning curve with each implementation
 - State to state interpretations of the test methods
- By 2003, only three states had **not** adopted the PG system



Need Supporting Materials

- Need content
- Can't use research reports
- Communicate complex concepts in a simple way



The Beginning

- In 2005, California became the last state to adopt the PG system
 - First used January 1, 2006. Used with polymer modified binders January 1, 2007.
- By this time, many states had been using the system for a decade but there was work to do.
 - Initially, as with any new system, variability was an issue.
 - Variability decreased with experience but seemed to stall.
 - In 2005, recognizing this slow-down, the Asphalt Institute Technical Advisory Committee recommended development of a national program to address the problem.
 - Based on program used in Northeast by NETTCP

PG Asphalt Binder Training



The Beginning

- Work began with Dr. Dave Anderson and the NorthEast Transportation Training and Certification Program.
 - The new National Binder Technician Certification program established reciprocity with the NETTCP
 - Dr. Anderson collaborated with AI on a new manual, *Asphalt Binder Testing*
 - Became the basis/text for National Binder Technician Certification (NBTC) program



Why a Certification Program?

- Why Certification?
 - Code of Federal Regulations
 - 23 CFR, Part 637, Quality Assurance (QA) Procedures for Construction
 - Issued 29 June 1995
 - “After June 29, 2000, all sampling and testing data to be used in the acceptance decision or independent assurance program will be executed by qualified sampling and testing personnel.”
 - What does “qualified” mean?

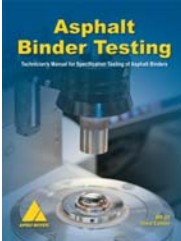
The Beginning


- Doubts about training asphalt binder technicians?
 - A big concern
 - What if we train them and they leave?
 - A bigger concern
 - What if we don’t train them and they stay?
 - The biggest concern
 - What if they are all trained differently?

What Makes a Quality Lab?

- Calibrated Equipment
- Knowledgeable Technicians
- Third-Party Review of Lab Operations
- Proficiency Sample Program Participation
- Quality Management Plan


National Binder Technician Certification (NBTC)





Program Textbook: MS-25

- New edition winter 2025



What Makes a Quality Lab?

- Calibrated Equipment
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 - Proficiency Sample Program Participation
 - Quality Management Plan
- } Testing Lab

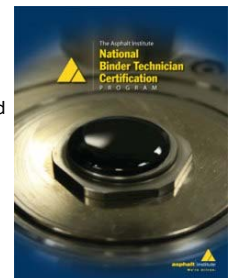
} AASHTO re:source

→ AASHTO R18

National Binder Technician Certification (NBTC) Program

AI Certification Vision

To provide a consistent nationwide means of ensuring that asphalt binder technicians are knowledgeable and fully qualified to produce valid specification compliance and quality assurance data.



National Binder Technician Certification

- Why should technicians become certified? What are the benefits?
 - Provide a concise standard interpretation of test methods
 - Decrease retesting by improving data quality
 - Promote a consistent laboratory best-practice
 - Increase confidence in data for use in product development
 - Tighten the precision and bias statements in published standards
 - Help reduce penalties, deducts and disputes

Written Exam

- Open book/note, multiple-choice exam
- 2 hours
- 60 questions
 - Four sections
 - Part 1 – General (24 questions)
 - Part 2 – Miscellaneous Tests and Aging (16 questions)
 - Part 3 – DSR
 - Part 4 – BBR
- Must score 80% or better (48 correct)
- Must also score 70% or better on each Part

NBTC Course

- 1.5 days of lecture
 - Intended as review, not training
- Covers 12 chapters in MS-25
 - Basic Information
 - Basic concepts, sampling and handling, thermometry, specification and grading
 - Chapters 1-6 (Part I)
 - Miscellaneous Tests
 - Rotational Viscosity, Flash Point, Specific Gravity, Plus Tests
 - Aging
 - RTFO, PAV
 - BBR, DSR, DTT

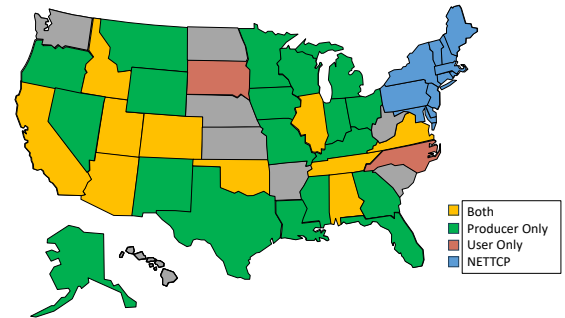
Innovation in 2020

- Virtual courses formed
- Eliminated travel costs to those with limited budgets
- Conducted in smaller chunks of time
 - Better for time-limited personnel
 - Reduced screen fatigue
- Allowed technicians to demonstrate proficiency on their own instruments in their own lab
 - Reduced stress during practical exam demonstrations
- Retesting process simplified
 - Previously, a retest was a big deal

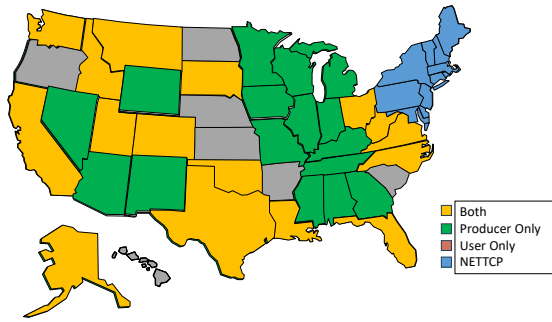
Laboratory Proficiency Exam

- Two tests to be demonstrated
 - DSR
 - BBR
- Why only two?
 - Time
 - Reasoning that a technician that can handle the most complicated procedures (DSR and BBR) can handle the rest
- Rare that experienced technicians fail

NBTC Representation (2008-16)



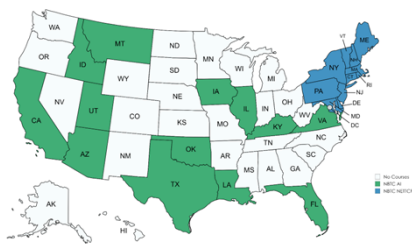
NBTC Representation (2008-24)



NBTC: Fifteen Things from Fifteen Years (Fall 2023)



NBTC Host States



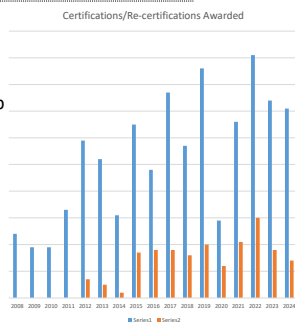
NBTC: Take-aways from 15+ Years

- **A Rocky Start: Reason for the NBTC revealed!**
 - 2008 started rough. Standards collecting dust.
- **Beware Outdated Crib Notes!**
 - They don't update themselves.
- **Second Chances: Sometimes it Takes Two.**
 - Review the most current published standards. You'll be glad you did.
- **Experience: Doesn't Always Mean "Correct"**
 - Years of wrong don't make it right.
- **Old Habits: Often Lead to Variability**



NBTC Program (2008-24)

- **Students who attempt the certification exams...**
 - Approximately 80% passing rate
 - More issues with written exam than lab proficiency exam
 - Testing issues
 - Language barriers
 - Retests possible
 - Some are not qualified with enough experience
- **Approximately 50% of certified technicians achieve re-certification**



NBTC Program 2008-24



March 2008



2024

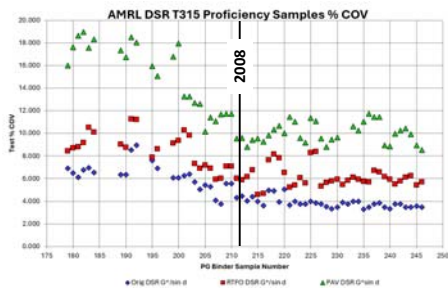
Does Experience, Training, and Certification Matter?

- Key Question
 - Believe it to be true, but...
 - How do you quantify?

T315 Precision Statement

	Acceptable Range of Two Results (d2s%)	
	Old Precision Statement (2005)	New Precision Statement (2019)
Single Operator (within Lab Variability)		
Original G*/sin δ	6.4	4.6
RTFO G*/sin δ	9.0	7.2
PAV G*/sin δ	13.8	11.2
Multilaboratory (between Lab Variability)		
Original G*/sin δ	17.0	10.2
RTFO G*/sin δ	22.2	16.8
PAV G*/sin δ	40.2	27.4

T315 Variability



PAV DSR DoE Factors and Levels

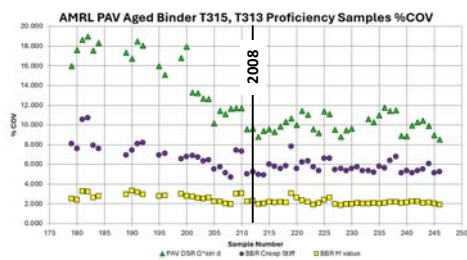
Factor	+1	-1	Reason
Thermal	Direct Transfer	Mold	Use of molds, 46 °C loading T
Geometry	8 mm PP*	25 mm PP*	Simple shear, trimming
	2 mm gap	1 mm gap	
Strain (%)	0.1	1	Linear viscoelasticity
Sample	Naphthenic	Waxy	Hardening tendency
Operator	New	Experienced	Experience

- 5 factors at 2 levels total 2⁵ or 32 individual test settings
- Test matrix was generated and randomized using Minitab® software
- Each setting was repeated four times to calculate standard deviation
- Half design (16 settings) found to be statistically significant in identifying contributors to test variability

*Parallel plates

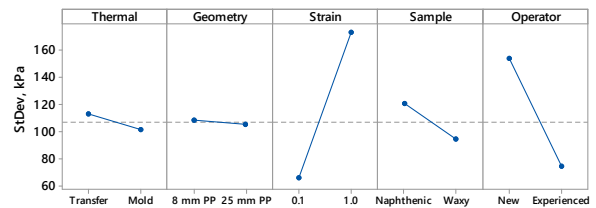
Pavel Kriz, ExxonMobil

PAV Residue, T315 DSR, T313 BBR



Karl Zipf, Delaware DOT

Factors Affecting Variability



- Each point represents a mean of half of the 64 total experiments
- Two geometries provide different result

Pavel Kriz, ExxonMobil

Binder Technician News

- Started in 2012
 - Means of providing some (hopefully) light reading for asphalt binder technicians
- Key Components
 - Feature Article
 - Tech Tip
 - Ask Mike
 - Technician Spotlight
- Mail Chimp Distribution



MS-25 4th Edition

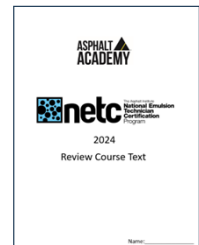
- Anticipated March 2025
- Revisions to all Chapters
 - Based on changes to standards
- New Structure
 - Combination of Existing Chapters 5 and 6
 - Chapter 5: Introduction to the PG Binder Specification
 - Chapter 6: Specifications and Grading
 - Some repetitive information
 - Add AASHTO M332 (MSCR)
- Understanding a Standard
 - AASHTO T240, Rolling Thin-Film Oven (RTFO)

Binder Technician News

Edition	Feature Article
Fall 2016	What Halloween taught me about G*/sinδ
Summer 2016	MSCR tune up
Winter 2016	Vacuum Degassing: Yes? No? Maybe?
Fall 2015	Rushing it: what not to do and why not to do it
Summer 2015	Don't be a specnoramus
Spring 2015	A lifetime of learning
Winter 2015	The NBTC goes global
Fall 2014	How an idea becomes a standard
Summer 2014	NBTC: A National Standard

National Emulsion Technician Certification (NETC)

- Modeled after the NBTC
 - Stand-alone program
 - No needed reciprocity
- Program workbook and text
 - Content from MS-19 and BET method overviews
 - Basis for upcoming new emulsion manual modeled after MS-25



Binder Technician News

Edition	Tech Tip
Fall 2016	Getting krafty in your lab
Summer 2016	Take the PRESSURE out of aging
Winter 2016	Building UP
Fall 2015	Making the cut
Summer 2015	A collection of tech tips
Spring 2015	Product review: Lab Lease Paper
Winter 2015	Product review: Brookfield Rotational Rheometer DV3T
Fall 2014	We can hardly "contain" our excitement
Summer 2014	Brought to you by the letter "Q"

National Emulsion Technician Certification (NETC)

- Important contributors
 - Arlis Kadrmas
 - Helped prioritize content
 - Angie Alvarado
 - Helped with class content and teaching



