

Asphalt Binders and Emulsions

Sampling and acceptance



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Agenda

1. Performance Graded (PG) Binders; what do those numbers mean? And why a “P” at the end
2. AASHTO M 320
3. AASHTO M332 (the next generation)
4. Emulsions
5. Sampling and Sample Cards (DT 1352)

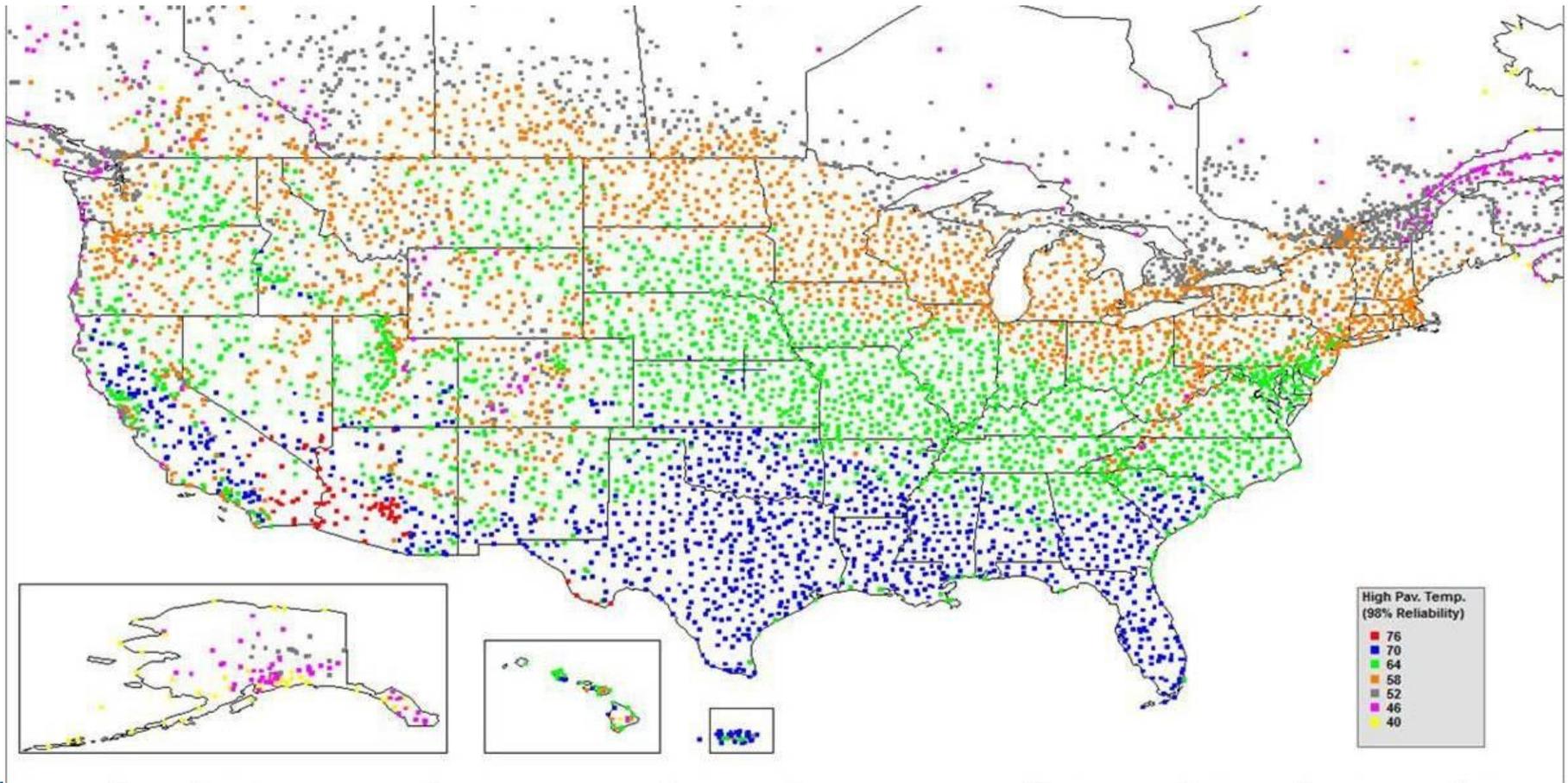


Performance Grade Binders, what do those numbers and the “P” mean? (64-34P)

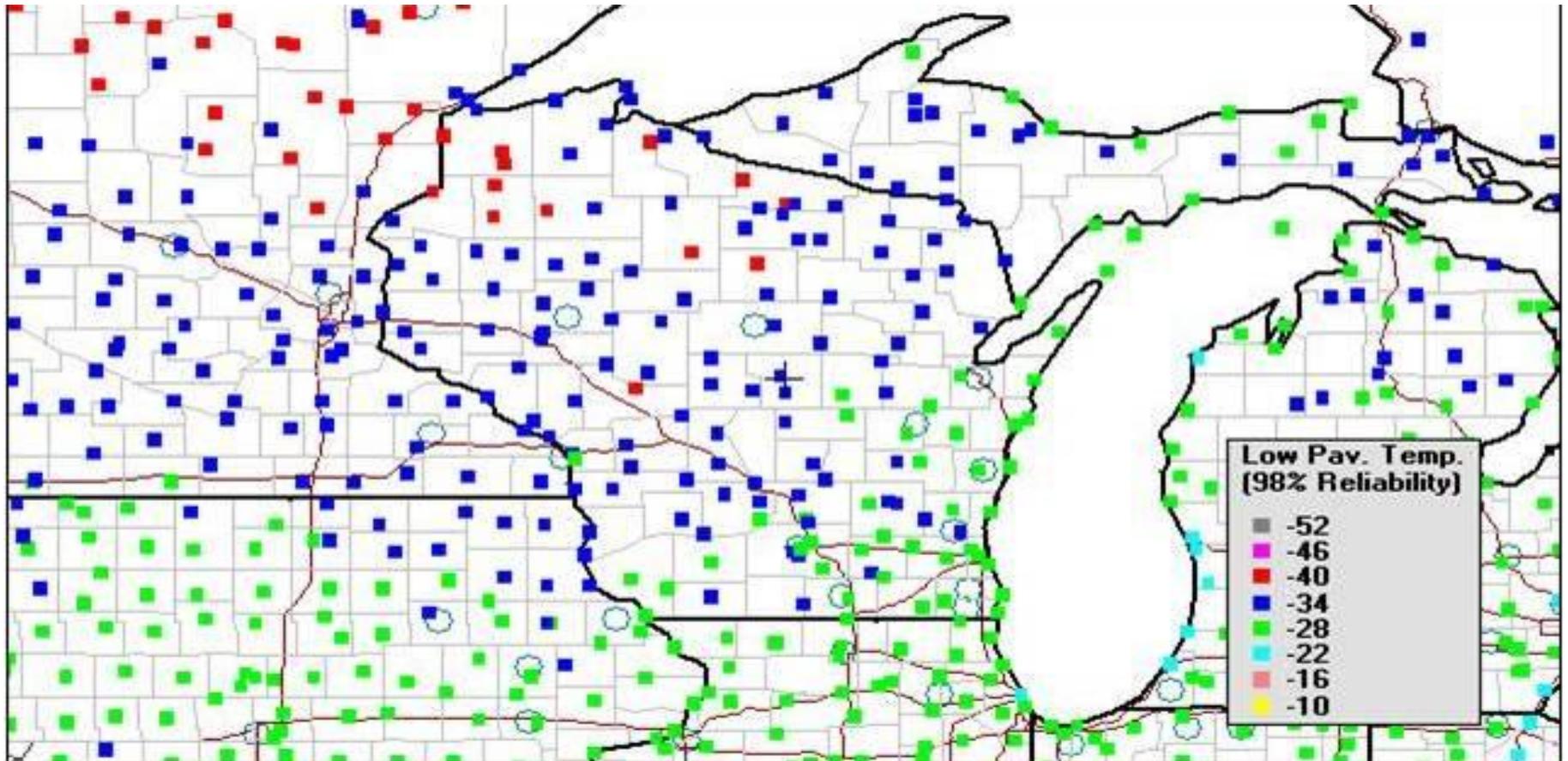
- ▶ 64°C
- ▶ Average 7-day maximum pavement design temperature
- ▶ -34°C
- ▶ The 1-day minimum pavement design temperature
- ▶ P = Polymer Modified



Long Term Performance of pavements (LTPP)



Long Term Performance of pavements (LTPP)



AASHTO M 320

Binder material is tested at design high and intermediate temperatures; e.i. 64-34P binder is tested at 64°C for the high temperature tests (Original DSR & RTFO DSR). Pressure Ageing Vesicle residue (PAV DSR) is tested at the intermediate temperature 19°C. The Bending Beam Rheometer (Low Temperature test) is tested at -24°C. The Phase angle must be $\leq 75^\circ$



Performance Grades

Avg. 7-day Max, °C	PG 46	PG 52				PG 58				PG 64				PG 70				PG 76				PG 82														
1-day Min, °C	-34	-40	-46	-10	-16	-22	-28	-34	-40	-46	-16	-22	-28	-34	-40	-10	-16	-22	-28	-34	-40	-10	-16	-22	-28	-34	-10	-16	-22	-28	-34					
ORIGINAL																																				
≥ 230 °C	(Flash Point) FP																																			
≤ 3 Pa·s @ 135 °C	(Rotational Viscosity) RV																																			
≥ 1.00 kPa	(Dynamic Shear Rheometer) DSR G * /sin ∂																																			
	46	52				58				64				70				76				82														
(Rolling Thin Film Oven) RTFO Mass Loss ≤ 1.00%																																				
≥ 2.20 kPa	(Dynamic Shear Rheometer) DSR G * /sin ∂																																			
	46	52				58				64				70				76				82														
(Pressure Aging Vessel) PAV																																				
20 hours, 2.07 MPa	90	90				100				100				100(110)				100(110)				100(110)														
≤ 5000 kPa	(Dynamic Shear Rheometer) DSR G * sin ∂ Intermediate Temp=[(7-day max + 1-day min)/2]+4																																			
	10	7	4	25	22	19	16	13	10	7	25	22	19	16	13	31	28	25	22	19	16	34	31	28	25	22	19	37	34	31	28	25	40	37	34	31
S ≤ 300 MPa m ≥ 0.300	(Bending Beam Rheometer) BBR “S” Stiffness & “m” - value																																			
	-24	-30	-36	0	-6	-12	-18	-24	-30	-36	-6	-12	-18	-24	-30	0	-6	-12	-18	-24	-30	0	-6	-12	-18	-24	-30	0	-6	-12	-18	-24	0	-6	-12	-18
≥ 1.00%	(Direct Tension) DT																																			
	-24	-30	-36	0	-6	-12	-18	-24	-30	-36	-6	-12	-18	-24	-30	0	-6	-12	-18	-24	-30	0	-6	-12	-18	-24	-30	0	-6	-12	-18	-24	0	-6	-12	-18

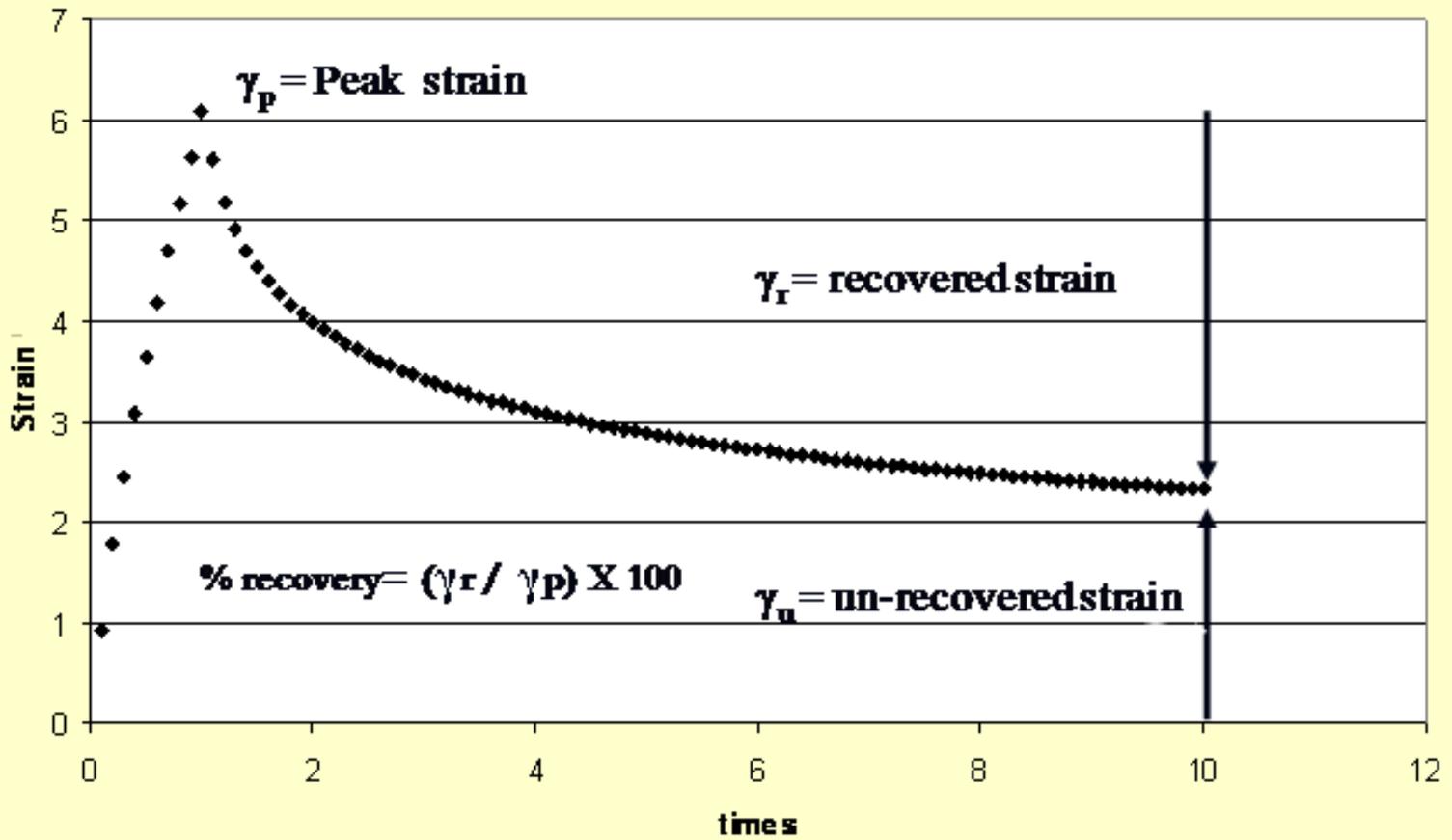


AASHTO M 332 (the next generation)

M 332 removes RTFO DSR and replaces it with T350 Multiple Stress Creep Recovery (MSCR) test, and TP 70 (% Recovery using MSCR). Test is performed on RTFO Residue at the nominal design high temperature, for Wisconsin that is 58°C. Elastic recovery is replaced by TP 70.

You will see different designations (S;H;V;E). So, a 64-34P will now be designated as 58E-34.





AASHTO TP 70

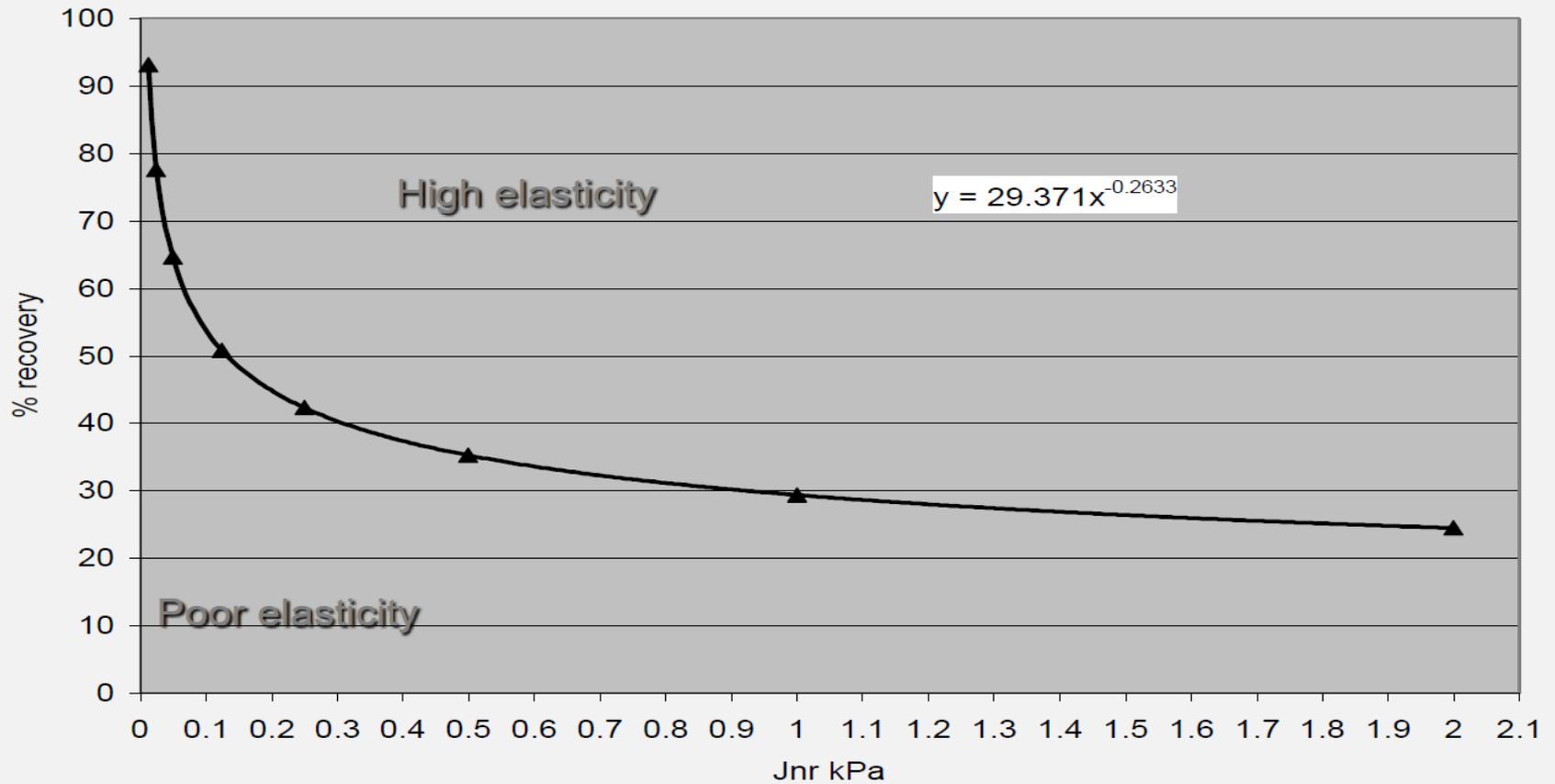


Table 1—Performance-Graded Asphalt Binder Specification^a

Performance Grade	PG 46			PG 52						PG 58					
	34	40	46	10	16	22	28	34	40	46	16	22	28	34	40
Average 7-day max pavement design temp, °C ^b	<46			<52						<58					
Min pavement design temp, °C ^b	>-34	>-40	>-46	>-10	>-16	>-22	>-28	>-34	>-40	>-46	>-16	>-22	>-28	>-34	>-40
Original Binder															
Flash point temp, T 48, min °C	230														
Viscosity, T 316: ^c max 3 Pa·s, test temp, °C	135														
Dynamic shear, T 315: ^d G*/sinδ, min 1.00 kPa ^e test temp @ 10 rad/s, °C	46			52						58					
Rolling Thin-Film Oven Residue (T 240)															
Mass change, max, percent ^f	1.00														
MSCR, T 350: Standard Traffic "S" $J_{nr3.2}$, max 4.5 kPa ⁻¹ $J_{nr diff}$, max 75% test temp, °C	46			52						58					
MSCR, T 350: Heavy Traffic "H" $J_{nr3.2}$, max 2.0 kPa ⁻¹ $J_{nr diff}$, max 75% test temp, °C	46			52						58					
MSCR, T 350: Very Heavy Traffic "V" $J_{nr3.2}$, max 1.0 kPa ⁻¹ $J_{nr diff}$, max 75% test temp, °C	46			52						58					
MSCR, T 350: Extremely Heavy Traffic "E" $J_{nr3.2}$, max 0.5 kPa ⁻¹ $J_{nr diff}$, max 75% test temp, °C	46			52						58					
Pressurized Aging Vessel Residue (R 28)															
PAV aging temp, °C ^g	90			90						100					
Dynamic shear, T 315: "S" G* sinδ, max 5000 kPa ^e test temp @ 10 rad/s, °C	10	7	4	25	22	19	16	13	10	7	25	22	19	16	13
Dynamic shear, T 315: "H," "V," "E" G* sinδ, max 6000 kPa ^e test temp @ 10 rad/s, °C	10	7	4	25	22	19	16	13	10	7	25	22	19	16	13
Creep stiffness, T 313: ^h S, max 300 MPa m-value, min 0.300 test temp @ 60 s, °C	-24	-30	-36	0	-6	-12	-18	-24	-30	-36	-6	-12	-18	-24	-30
Direct tension, T 314: ^h Failure strain, min 1.0% test temp @ 1.0 mm/min, °C	-24	-30	-36	0	-6	-12	-18	-24	-30	-36	-6	-12	-18	-24	-30



Sampling problem

The Asphalt Paving contractor tells you, “we will have 36 loads of PG 64-34P asphalt binder for this project.” How many samples will you need to take?

Answer **1**

Reasoning: 36 truck loads at 25 ton each = 900 Ton;



Sampling Now

The supplier or contractor personnel will obtain samples, under the observation of a Department representative, by random selection from shipments of material at the job site. The sampling rate will be a minimum of one (1) per 800 Mg (900 tons) for each supplier and grade of asphalt binder, or fraction thereof, per contract. For contracts with less than approximately 23 Mg (25 tons) (one truck transport) of asphalt, sampling may be waived.

Sampling method shall be accomplished by taking a one-liter (one-quart) sample of material representing the middle third of the load from a sample valve attached to the transport in accordance with AASHTO Designation T40 section 10 paragraph 10.1 or other department approved supplier method as outlined in the QC plan.



Sampling Starting 2015

The supplier or contractor personnel will obtain samples, under the observation of a Department representative, by random selection from shipments of material at the job site. The sampling rate will be a minimum of one (1) per 800 Mg (900 tons) for each supplier and grade of asphalt binder, or fraction thereof, per contract. For contracts with less than approximately 23 Mg (25 tons) (one truck transport) of asphalt, sampling may be waived.

Sampling method shall be accomplished by taking a one-liter (one-quart) sample of material representing the middle third of the load from a sample valve attached to the transport in accordance with AASHTO Designation T40 section 10 paragraph 10.1.



Sampling



Asphalt Binders

Sample according to the department's "Combined State Binder Group Certification Method of Acceptance for Asphalt Binders".

AASHTO Designation T40 section 10 paragraph 10.1.

Use only clean, dry sample container free from cleaning oil or other contamination. Do not contaminate.

Include the Bill of Lading



Emulsified Asphalts

Obtain representative samples according to
AASHTO T40

1 per contract when more than 2,500 gallons is
used (2-quart plastic container)

Use only clean, dry sample containers free from
cleaning oil or other contamination. Do not
contaminate samples.



Sample Cards (DT 1352)

- ▶ DT 1352 is a Word Document that can be downloaded from the DOTNET. The form can be filled out and submitted with the sample. Please fill it out completely.





DT1352 1/2006

Project ID (One project only) 1111-11-11		County Dane	Region SW
Description Highway 151 Shoulders			
Limits (For multi-section projects only) Dane County Line to Highway 78		Highway 151	
Prime Contractor Payne & Dolin		Subcontractor	
Asphalt Material (Type and grade) PG 58-28			
Contact Name and Telephone Number Sam Snead 608-555-7788			
Sampled By (State representative only) Sam Snead		Date Sampled 6/12/2014	
Supplier (Include shipping point) CRM - Milwaukee			
Sample Number 1		Invoice (Or other ID Number) 40801 4001 0000123	
Tons or Gallons 25.23 Ton			
Remarks			

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Project ID (One project only) 1111-11-11		County Dane	Region SW
Description Highway 151 Shoulders			
Limits (For multi-section projects only) Dane County Line to Highway 78		Highway 151	
Prime Contractor Payne & Dolin		Subcontractor	
Asphalt Material (Type and grade) SS-1H			
Contact Name and Telephone Number Sam Snead 608-555-7788			
Sampled By (State representative only) Sam Snead		Date Sampled 6/12/2014	
Supplier (Include shipping point) Seneca Petroleum - Lemont, IL			
Sample Number 1		Invoice (Or other ID Number) LC 201400561	
Tons or Gallons 6119 Gallons			
Remarks			

DT1352 1/2006





DT1352 1/2006

Project ID (One project only) 1111-11-11		County	Region
Description			
Limits (For multi-section projects only)			Highway
Prime Contractor P & D		Subcontractor	
Asphalt Material (Type and grade) AC			
Contact Name and Telephone Number			
Sampled By (State representative only) <i>Plant Foreman</i>			Date Sampled
Supplier (Include shipping point) Flint Hills			
Sample Number		Invoice (Or other ID Number)	
Tons or Gallons 0-900 Ton			
Remarks			



DT1352 1/2006

Project ID (One project only) 2222-22-22		County	Region
Description			
Limits (For multi-section projects only)			Highway
Prime Contractor Mathy		Subcontractor	
Asphalt Material (Type and grade) TACK			
Contact Name and Telephone Number			
Sampled By (State representative only) <i>Tack truck Driver</i>			Date Sampled
Supplier (Include shipping point) Mathy			
Sample Number		Invoice (Or other ID Number)	
Tons or Gallons			
Remarks			



Links to Combined State Binder Group Document, Supplier List, and Round Robin Results

WIDOT ftp site Link

<ftp://ftp.dot.wi.gov/dtsd/bts/quality/general>

The latest version of the “Document” is 2013. 2015 will be out next year, and posted in the ftp site.



Questions or Comments

