

TxDOT Project 0-5833:
**Guidelines on Variable
Asphalt Shot Rates for Seal
Coats**

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Seal Coat Statistics

- **Contracted Seal Coats**
 - About 16,000 lane miles per year
- **State Force Seal Coats**
 - About 3000 lane miles per year
- **Average life of a seal coat: ~ 6 to 8 years.**

Presentation Overview

- ❖ **Defining TVAR and Its Value**
- ❖ **Specifications for TVAR**
- ❖ **Where to Use TVAR**
- ❖ **Selecting TVAR Shot Rates**
- ❖ **Inspecting and Calibrating Distributor**

Defining TVAR and Its Value

What Is Transverse Variation of Asphalt Rate (TVAR)?

TVAR is the seal coat practice of varying the amount of seal coat asphalt being applied across the width of the pavement to better match the asphalt needs of the existing pavement surface.

Defining TVAR and Its Value



TVAR

A common misconception is that TVAR reduces the amount of asphalt being placed on the roadway. TVAR actually increases the total amount of asphalt being used if prior practice has been to design the asphalt rate based only on wheel path conditions.

What We Learned from Survey of TxDOT Districts

- ❖ **13 Districts Were Using TVAR as Standard Practice**
- ❖ **3 Districts Used TVAR as Standard Practice in the Past but Don't Anymore**
- ❖ **1 District Was Currently Experimenting with TVAR**
- ❖ **2 Districts Experimented with TVAR and Decided Not to Use It**
- ❖ **8 Districts Reported No Use in Last Five Years**

Specifications for TVAR

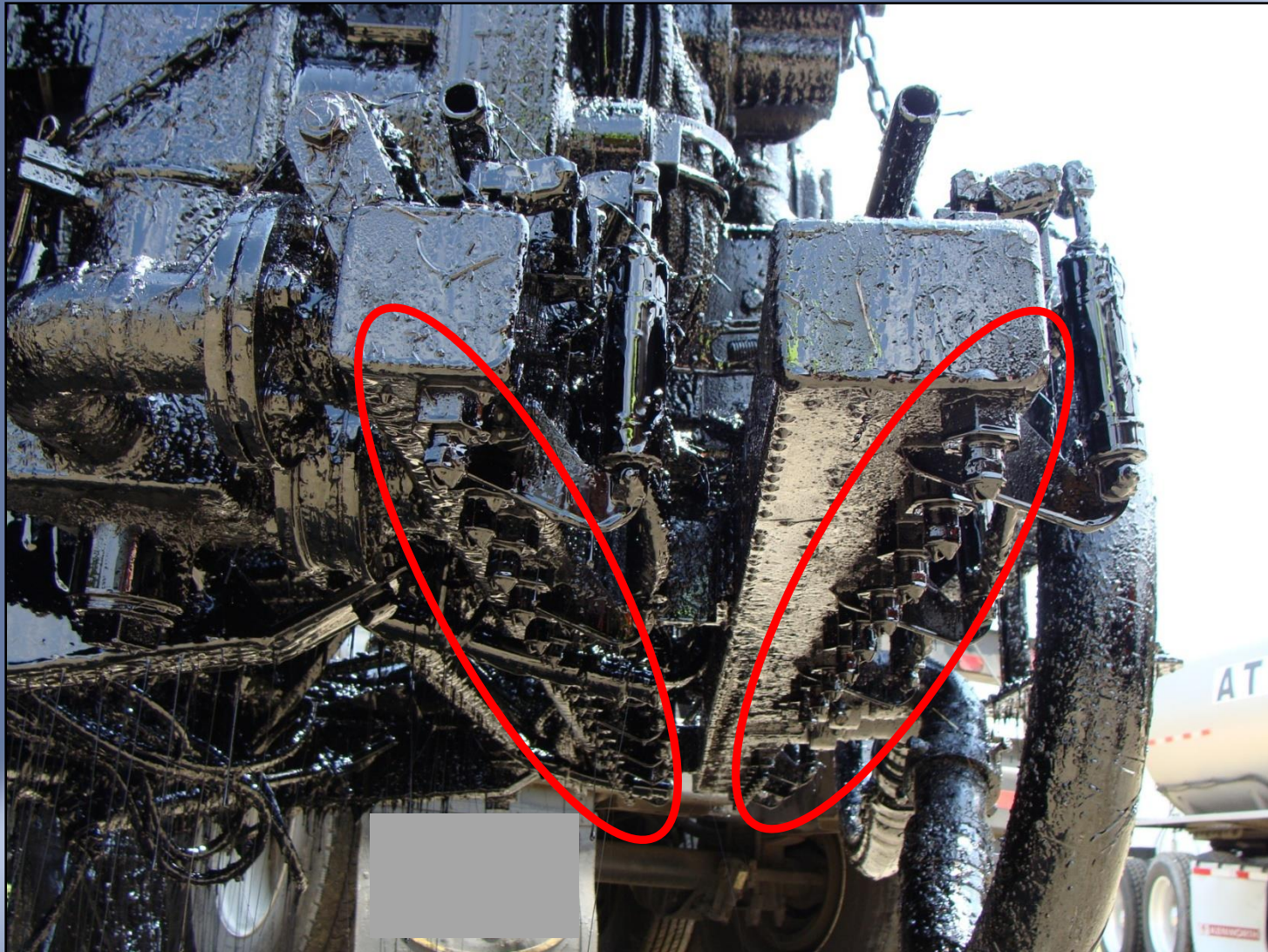
What About TVAR Specifications?

- ❖ **No Special Provision to TxDOT Item 316 Is Needed**
- ❖ **Include by Plan Note**
- ❖ **Clarifies Additional Distributor Calibration Procedure**
- ❖ **States that the Engineer Will Determine Where TVAR Will be Used**

TVAR Plan Note

- **Distributor Must Be Able to Provide at Least One TVAR between 22 and 32 Percent**
- **Allows Both Common Distributor Types:**
 - distributors with dual spray bars and separate computer controllers, and
 - standard distributors where the operator will have to change out nozzles more frequently

Dual Spray Bar Distributor



Where to Use TVAR

Considering Why and When to Use TVAR

- Wherever asphalt demand varies across the road
- Asphalt type and grade are not factors when considering use of TVAR
- Aggregate type is not a factor
- May be placed on any pavement surface
- But, it's recommended that districts without experience with TVAR begin with applications over existing seal coats with wheel path flushing

Selecting Roadway Sections Appropriate for TVAR by Visual Appearance

Severe Flushing



Moderate to Severe Flushing



Moderate Flushing



Mild to Moderate Flushing

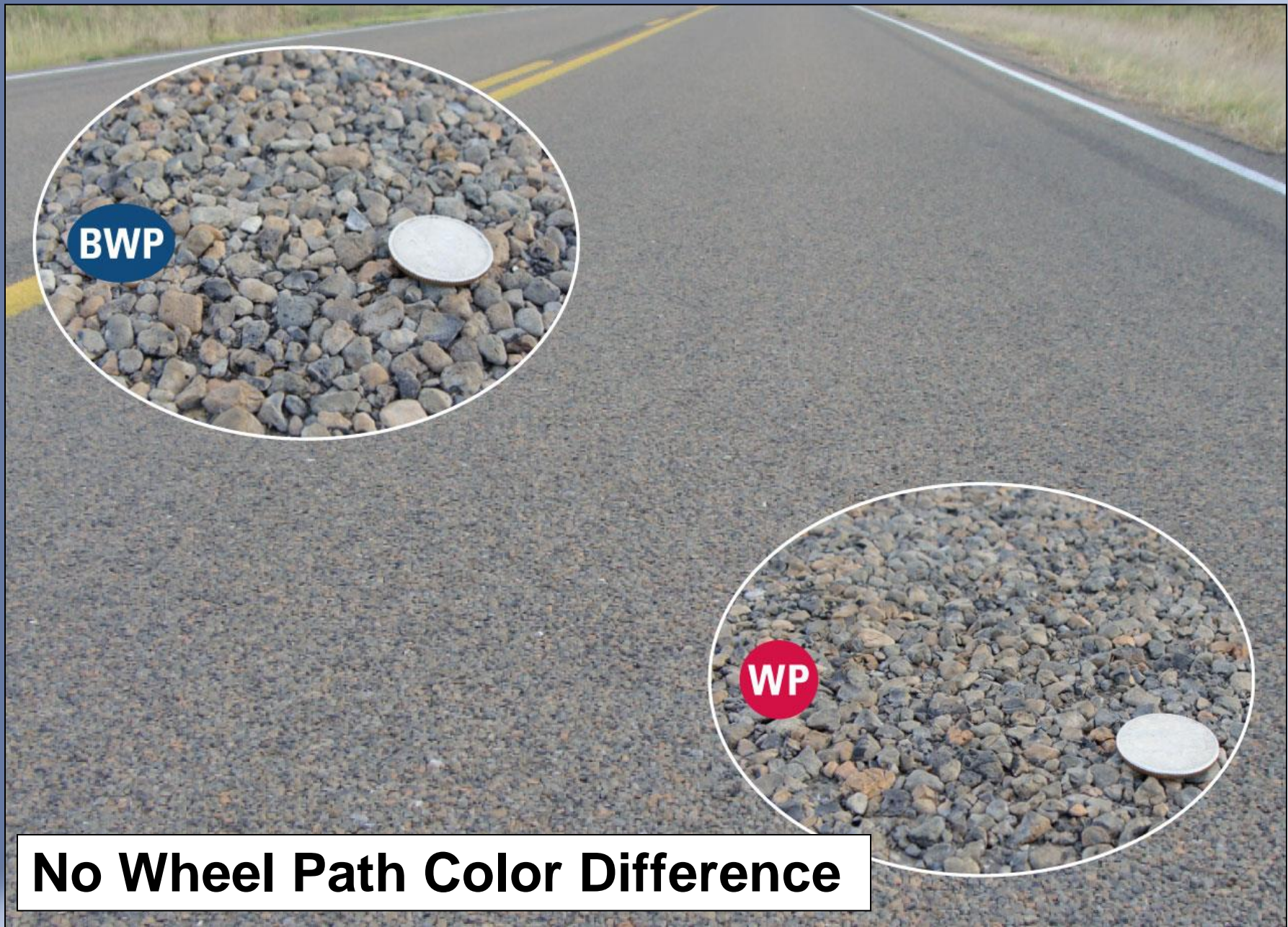


Mild Flushing





Slight Wheel Path Color Difference



No Wheel Path Color Difference

Situations to Avoid TVAR Use

- With Grade 5 (1/4-in) aggregate
- With emulsions on full super-elevated curves
- On new construction
- On shoulders and other non-traffic locations
- In continuous left-hand turn lanes where traffic patterns are random
- In intersections where the side street also carries considerable traffic volume, and
- On flushed or bleeding hot mix pavements that may have stripping or an otherwise unstable pavement layer below

Selecting TVAR Shot Rates

Determining Design Asphalt Rates for Wheel Paths

- The design asphalt application rate for each roadway must always be the rate deemed optimal for the wheel paths to hold the new wheel path aggregate without the asphalt later flushing to the surface.

Determining the TVAR Percentage for Outside the Wheel Paths

- TVAR Use with Single Spray Bar Distributors
- TVAR Rates with Dual Spray Bar Distributors
- Texture Testing When Uncertain About TVAR Rate to Use

Sand Patch Test



Measuring Diameter



Selecting TVAR Shot Rates

Roadway and Condition	Sand Patch Average Diameters, mm		
	Wheel Path	Between Wheel Paths	Difference
Severe Flushing of Grade 3 Seal Coat	199	111	88
Moderate to Severe Flushing of Grade 3 Seal Coat	200	117	83
Moderate Flushing of Grade 3 Seal Coat	174	129	45
Mild to Moderate Flushing of Grade 3 Seal Coat	177	129	48
Mild Flushing of Grade 3 Seal Coat	184	121	63
Slight Color Difference across Recent Grade 4 Seal Coat	121	99	22
No Visible Color Difference across Recent Grade 4 Seal Coat	121	112	9

Guidance for Interpreting Sand Patch Test Results

Difference in Sand Patch Average Diameters	Asphalt Rate Increase Outside of Wheel Paths
Less than 20 mm	None
21 to 50 mm	15%
Greater than 50 mm	30%

Inspection and Calibrating the Distributor

Calibrating and Inspecting the Asphalt Distributor

- Several additional distributor checks which should be done by the contractor and observed by the inspector
- Selection of nozzles to provide the desired asphalt rate variation is a contractor decision to be verified during the additional distributor calibration run or runs

Suggested Nozzle Configurations

Lane Width, Feet	Number of Center Line to Wheel Path Nozzles	Number of Inside Wheel Path Nozzles	Number of Between Wheel Path Nozzles	Number of Outside Wheel Path Nozzles	Number of Wheel Path to Pavement Edge Nozzles
9	1	9	6	9	2
10	2	9	6	9	4
11	4	9	7	9	4
12	5	9	8	9	5
12 (with edge line)	6	9	8	9	4
13	7	9	8	9	6

Setting Computerized Distributor Controls

- Correct determination and entry of the asphalt rate into the distributor's computer controller is a critical point for inspection
- Single spray bar and computer

Formula for Determining Average Shot Rate

$$\text{Average Rate} = [(L/100) \times (V/100) \times R] + R$$

where:

L = % of larger nozzles = (number of larger nozzles/total number of nozzles) X 100,

V = % increase in asphalt rate selected for outside of the wheel paths, and

R = design rate of asphalt application for the wheel paths in gallons/SY.

Setting Computerized Distributor Controls

- Correct determination and entry of the asphalt rate into the distributor's computer controller is a critical point for inspection
- Single spray bar and computer
- Dual spray bars and computers

TVAR Distributor Calibration

- The Contractor Does His Normal Calibration, Plus
- Single Bar Distributor - Demonstrate that the Distributor Will Provide a TVAR within the Range of 22% to 32%
- Dual Bar Distributor – Recommendation is to Request Demonstration at 15% and 30% TVAR

Determining When Adjusting TVAR Is Appropriate



Summary

- ❖ **TVAR Is a Proven, Successful Technique**
- ❖ **TVAR Provides a Means of Increasing the Design Shot Rate Outside of the Wheel Paths when Wheel Path Flushing Requires a Low Design Rate.**
- ❖ **All Seal Coat Contractors Should Be Able to Provide a TVAR Percentage Between 22% and 32%.**

Summary

- ❖ **TVAR May Be Used with both Emulsions and Asphalt Cements**
- ❖ **TVAR May be Used with Gr. 3 (1/2-in) and Gr. 4 (3/8-in) Aggregate, Lightweight and Hard Rock, and with Precoated and Plain Aggregate**
- ❖ **Design Asphalt Rates Should Always be Selected to Meet Wheel Path Asphalt Needs as Optimally as Possible. This Will Reduce and Sometimes Eliminate Reoccurrence of Wheel Path Flushing.**

Summary

- ❖ **Visual Observation of Wheel Path Flushing Allows Reasonably Good Determination of Need for TVAR.**
- ❖ **Difference in Texture Depth Across the Width of the Pavement Is a Good Indicator of TVAR Desirability**
- ❖ **The Sand Patch Texture Test Can Provide Helpful Information in this Determination, Particularly When the Contractor Is Capable of Adjusting TVAR in Small Increments.**

Questions