BEST PRACTICES WITH CHIP SEALS

by

Scott Shuler

What Are Chip Seals?

Traffic Control

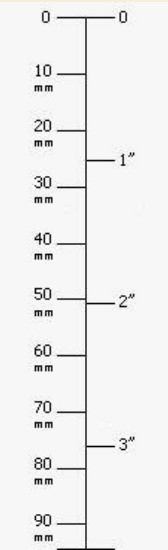
Steps Involved

- Preconstruction
  - Select Appropriate Pavement
  - Select Materials
  - Design Quantities
  - Equipment Calibration
- Construction
  - Weather
  - Preparing Surface
  - Binder Application
  - Chip Application
  - Rolling
  - Sweeping
  - Traffic Control
- QC
  - Sieve Analysis
  - Moisture Content
  - Embedment Depth
  - Emulsion Viscosity

Aggregate

- Properties
  - Crushed
    - 2 Mechanically Fractured Faces
  - Hard

Like THIS Right?



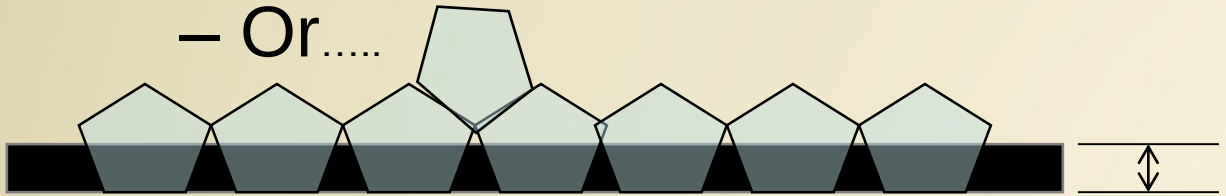

Damp Chips

Design

- Chip Quantity
- Emulsion Quantity
- Substrate Condition

Chip and Emulsion Quantity

- Spread Rate
  - One Stone Thick
  - Or.....



About 40%

Getting it One Stone Thick

- Do ‘Board Test’
  - Spread Chips One Stone Thick on 1 sy Board
  - Weigh it

Emulsion

- Properties
  - Thick Enough, but Not Too Thick
  - Fast Setting, but Not Too Fast
  - Sticky

- Spray Rate
  - Embed Chips about 30-50% Initially
  - Traffic Embeds to 75-90%

Substrate Too Soft?

Spray Rate in gsy

$$= \%\text{embedment} \times \text{avg mat depth} * [\{1 - (W / 62.4\ G)\} * T] + V$$

- Where
  - W = Loose Unit Weight of Aggregate, pcf
  - G = Bulk Specific Gravity of Aggregate
  - T = Traffic Correction
  - V = Surface Condition Correction

Conditions

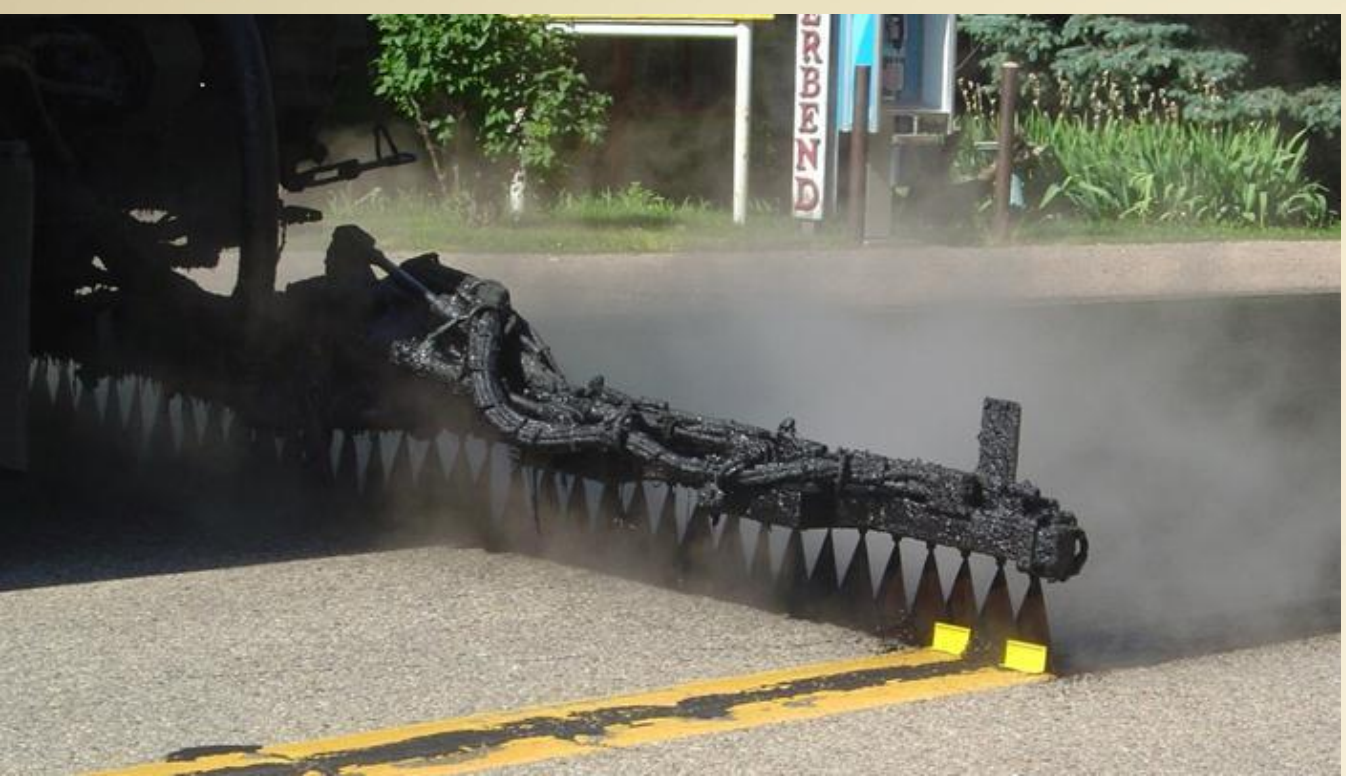
- Dry
  - No rain threatening
  - Pavement Dry
- Low Wind
  - <10 mph
- Temperate
  - 60 - 90F

Texture

Equipment Calibration


CRC Computerized Rate Control
BearCat

Because This is What We Want

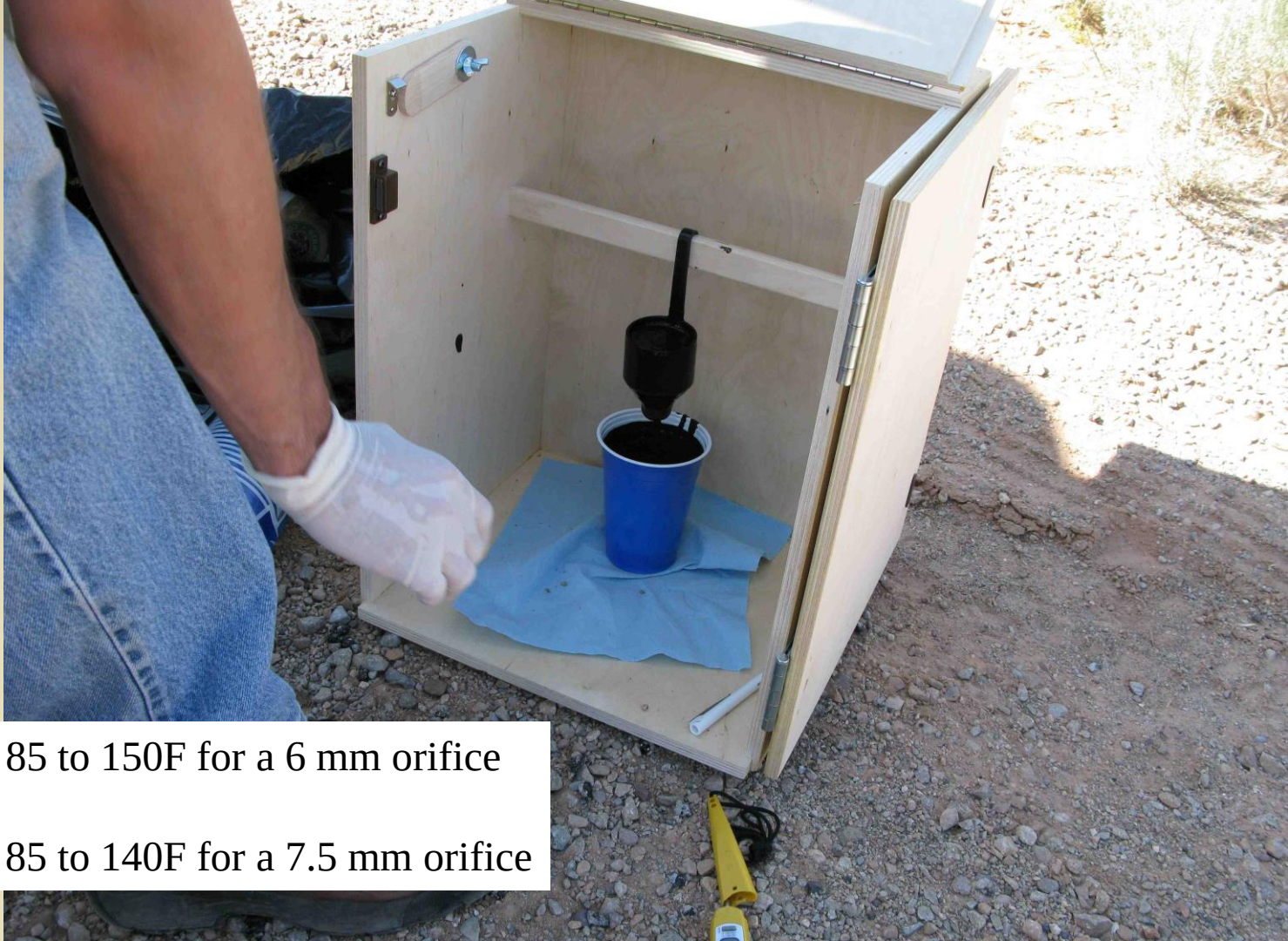


.....Almost

First:
Take It’s Temp


TREND
This is Too Cold !

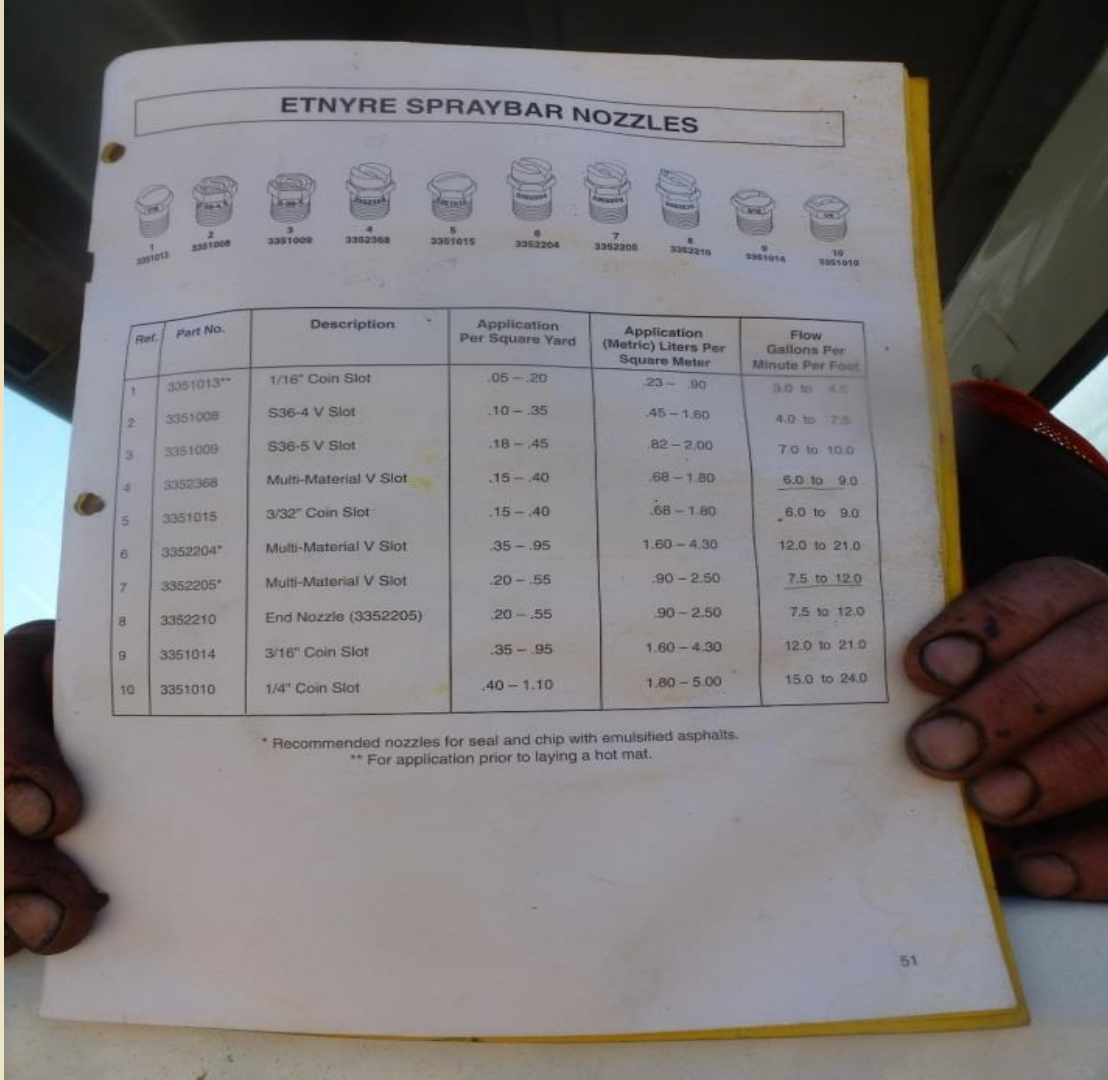
Second:
Measure Viscosity



20 to 70 seconds at 85 to 150F for a 6 mm orifice
or
10 to 60 seconds at 85 to 140F for a 7.5 mm orifice

Third:
What's the Nozzle Size?

The Right Nozzle for the Job



ETNYRE SPRAYBAR NOZZLES

Ref.	Part No.	Description	Application Per Square Yard	Application (Metric) Liters Per Square Meter	Flow Gallons Per Minute Per Foot
1	3351013**	1/16" Coin Slot	.05 – .20	.23 – .90	3.0 to 4.5
2	3351008	S36-4 V Slot	.10 – .35	.45 – 1.60	4.0 to 7.5
3	3351009	S36-5 V Slot	.18 – .45	.82 – 2.00	7.0 to 10.0
4	3352368	Multi-Material V Slot	.15 – .40	.68 – 1.80	6.0 to 9.0
5	3351015	3/32" Coin Slot	.15 – .40	.68 – 1.80	6.0 to 9.0
6	3352204*	Multi-Material V Slot	.35 – .95	1.60 – 4.30	12.0 to 21.0
7	3352205*	Multi-Material V Slot	.20 – .55	.90 – 2.50	7.5 to 12.0
8	3352210	End Nozzle (3352205)	.20 – .55	.90 – 2.50	7.5 to 12.0
9	3351014	3/16" Coin Slot	.35 – .95	1.60 – 4.30	12.0 to 21.0
10	3351010	1/4" Coin Slot	.40 – 1.10	1.80 – 5.00	15.0 to 24.0

* Recommended nozzles for seal and chip with emulsified asphalts.
** For application prior to laying a hot mat.

51

ROSCO SPRAY NOZZLE GUIDE

NOZZLE SIZE	PART NO.	FLOW RATE GPM MAX	APPLICATION RATE GAL PER SQ YD
No. 00	35565	1.2	.03 - .08
No. 0	32917	3.0	.05 - .20
No. 1	32918	4.0	.10 - .30
No. 2	32919	8.5	.25 - .55
No. 3	32920	13.5	.35 - 1.0

CORRECT NOZZLE DEPENDS ON APPLICATION RATE, TRUCK SPEED AND TYPE OF MATERIAL BEING SPRAYED.

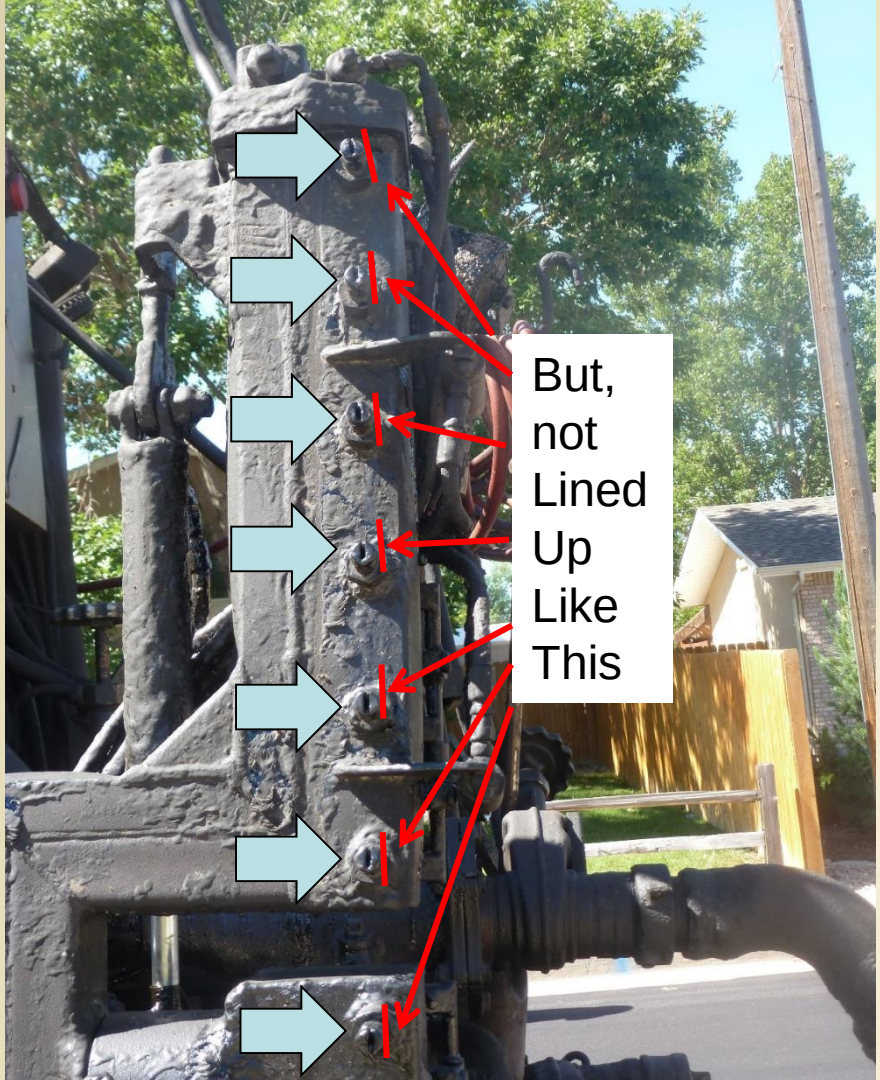
- EXCEEDING NOZZLE MAX FLOW RATE MAY CAUSE FOGGING.
- EXCEEDING 400 FPM TRUCK SPEED AT MAX APPLICATION RATE FOR NOZZLE WILL EXCEED MAX FLOW RATE.
- USING NOZZLE TOO LARGE WILL CAUSE POOR SPRAY PATTERN.

36986

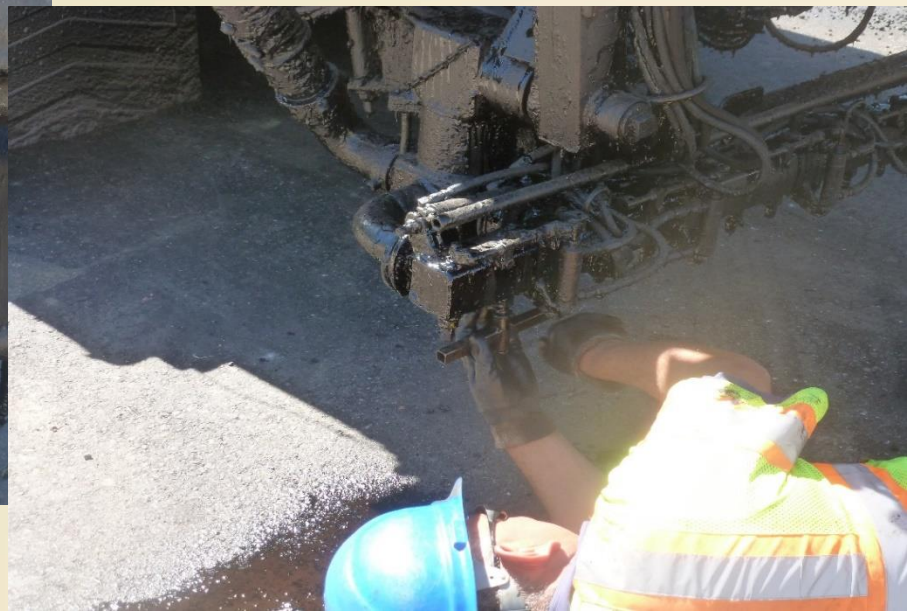

95
15

Fourth:
Where Do They Go?

Right Here



Use The Wrench

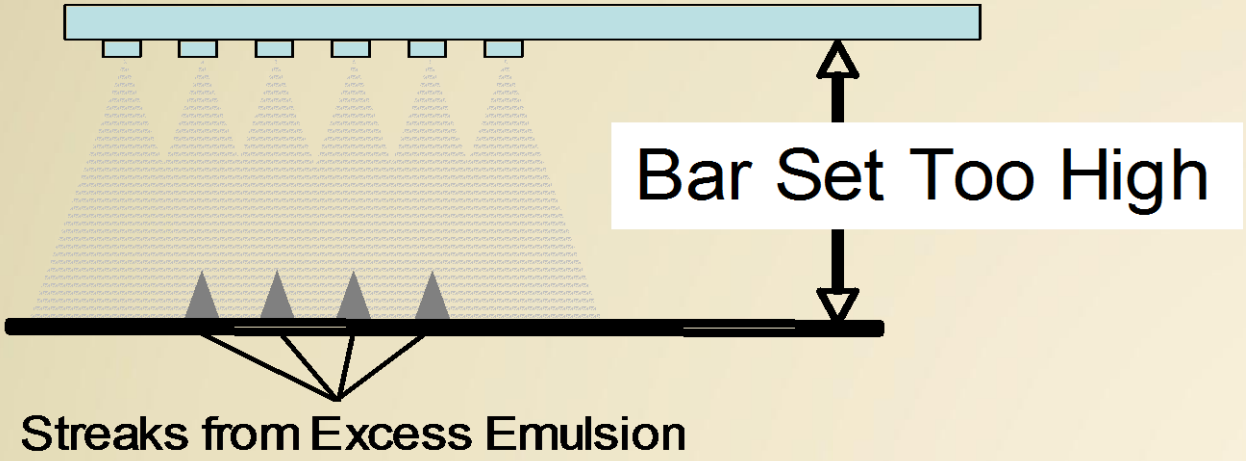


15 to 30 degrees


All Nozzle Angles Should be Equal
Or…

Fifth:
How High The Bar?

This is Too High


Bar Set Too High
Streaks from Excess Emulsion

This is the Result

Sixth:
Are We Spraying the Correct Rate?

Use the Gauge?

NO !

Use the Dip Stick

For Etnyre, 0 gal is at the Top !

Match Transverse Joints

- Start and Stop on Paper

Seventh
Is the Spreader Calibrated?


How Even is the Veil ?

Measure the Distance and Width to Get Rid of Two or Three Truckloads

This is Your Chip Spread Rate

8
How Many Rollers?

- Rubber-Tire
  - 3 mph, Max (fast walk)
  - Equal Tires
  - Equal Tire Pressure
- Enough for 1 Coverage Before Gelling

9
When Do We Sweep?

NCHRP Report 680
“Broom Simulator”

- Brooms
  - Push or Pickup
    - EASY Pressure
    - Nylon
  - Timing
    - Before Traffic
    - When Moisture is < 85%


Pilot Car
FOLLOW
ME

Traffic Control

- Pilot Cars
  - 15-25 mph depending on traffic volume

10
Some Tips


FREIGHTLINER
'Light' Showing Through Should be Uniform


Nice Veil
But…


CATERPILLAR
Excess Chips


Edge Nozzle Needed


Thank You !