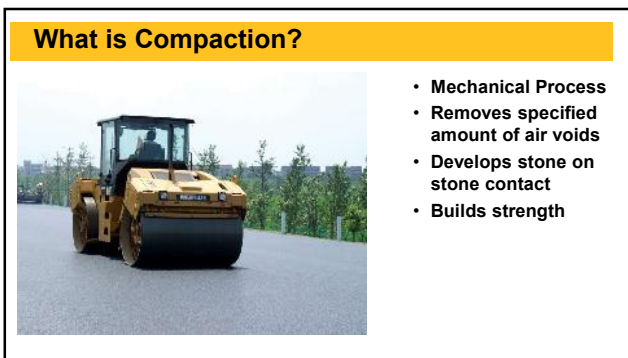
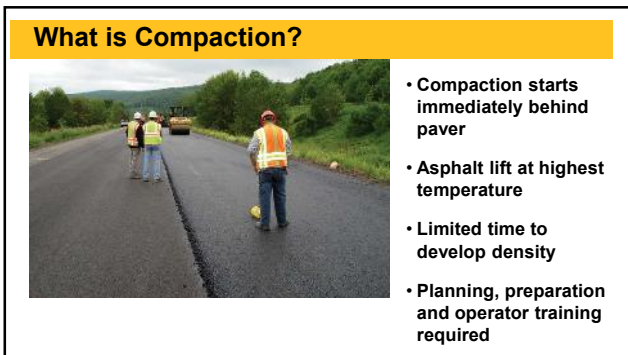




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2



3

Best Practices for Compaction

- Type of rollers
- Number of rollers
- Roller settings
- Number of passes (coverage)
- Mix temperature
- Rolling mainline
- Rolling transverse & longitudinal joints
- Pre-compaction w/ screed
- Stopping-Starting the roller
- Smoothness – where do we stop to get water, change direction, supported-unsupported edges, tie-ins

4

4

How do we achieve density?

1. Understand the factors affecting compaction
 - Mix temperature & time available for compaction
 - Four forces of compaction
2. Understand different types of rollers and how they work
 - Steel drum, pneumatic, combination, oscillation, offset drums
3. How to establish a rolling pattern that achieves density & smoothness
 - How to determine roller settings
 - Determining the number of passes
 - Dealing with harsh & tender mixes
 - Good communication!!

5

Lines of Communication

Mokona Renee	Project Manager	555-234-1245
Leta Ina	Equipment Manager	555-234-1245
Alwaysui Myphone	Area Superintendent	555-234-1245
Ihaki Timocardo	Paving Foreman	555-234-1245
Orange Cone	Traffic Control	555-234-1245
Big Mack	Trucking	555-234-1245
Marshall Hammer	Quality Control Manager	555-234-1245
Trinity Formore	Water truck	555-234-1245
Reemaw Andreplice	DOT Inspector on site	555-234-1245
Inti Mize	Batch room @ drum plant	555-234-1245
Tullioo Anujib	Equipment dispatch	555-234-1245
I. Fivr	Mechanic	555-234-1245

The diagram is a circular flow of communication. At the center are 'Foreman', 'Superintendent', 'Truck Boss', and 'Project Manager'. Surrounding this center are four main roles: 'Paver' (top-left), 'Rollers' (top-right), 'QC Team' (bottom-right), and 'Hot Plant' (bottom-left). Arrows indicate a clockwise flow of communication between these roles.

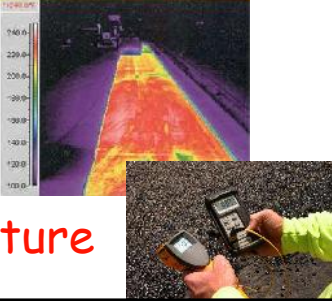
6

What does it take to get density?

Temperature

Temperature

Temperature



7

Time Available for Compaction


Density must be achieved while the mix is still **HOT**



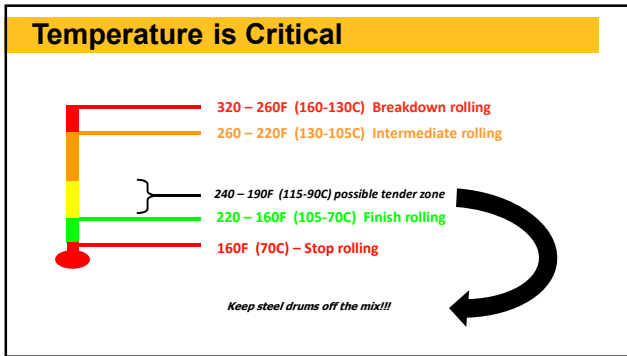
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Temperature! Temperature! Temperature!

- Compact while hot!
- Stay close to paver
- open-textured mixes cool quicker



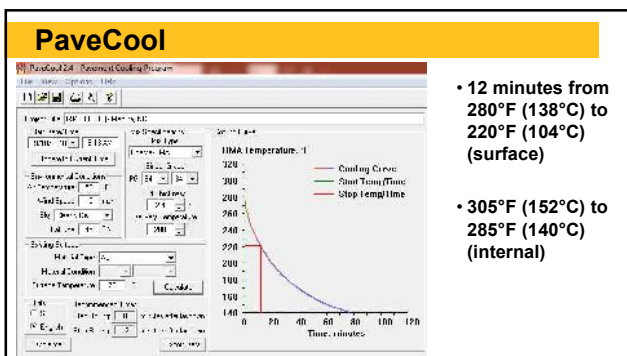
9



10

PaveCool or Multi-Cool website and App

11



12

Temperature: End dumps/windrow/MTV



- Keep windrows short
- MTV can help with uniform temperatures
- Keep tarps on trucks

13




Good tarp **Poor tarping**

14

Mix Temperature


- Creating density easiest at high temperature
- Upper limit about 320°F (160°C)
- Watch for layer movement in fine mixes
- Stay back if layer is tender due to high temperature



mat too hot →

15

Mix Temperature




- Reach target density before mat cools
- Lower limit about 190° F
- Work close to paver
- Increase compaction energy
- Add breakdown rollers

16

Mix Temperature

Tender Zone


- Some mixes get tender between upper and lower limits
- Surface moves under drums or tires and cracks appear
- Work ahead of tender zone and after



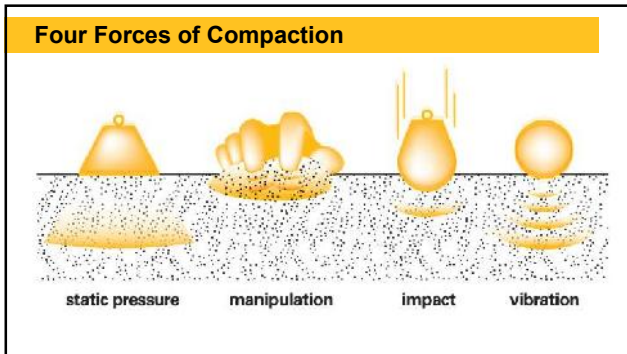
17

Climate Conditions

- High ambient temperature
 - asphalt retains heat
 - longer compaction time
- Low base temperature
 - heat transfers quickly to base
 - shorter compaction time
- Low ambient temperature
 - asphalt cools faster
 - shorter compaction time
- Adjust rolling pattern as ambient conditions change



18



19

Roller types and settings...

- Static steel drum
 - high PLI
- Vibratory steel drum
 - low amplitude, high frequency
 - oscillation
- Pneumatic tire
 - should not be used

20

Design and Specification considerations

- Lift thickness: NMAS
- NCAT Report 9-27
 - Fine 3:1 or greater
 - Coarse 4:1 or greater
 - SMA 4:1 or greater
- Density Specs
 - minimum 94% ??
 - abolish upper limit??

21

What are the job specs?

- What is the minimum density requirement for mainline? 92-97% (Theoretical Maximum Density TMD)
- Joint density? 90% Shoulders? n/a
- Smoothness? IRI improvement? 67% - one lift
- How will density be measured and accepted? Cores?



22

Establish an effective rolling pattern



1. Based production and density
 2. Equipment Selection
 3. Balance paver & roller speed
 4. Test Strip
 5. Verify during production
- Decision Point
- Decision Point


23

	Breakdown	Intermediate	Finish
%TMD	90-92%	92-94%	94+ %
Temp	300-260 F (150-127C)	260-200 F (127-93C)	200-160 F (93-71C)
Coverage	3	2	2 (1 vibrate, 1 static)
Settings	High A, Low F	90 psi	Low A, static
	126 ft (38m)	200 ft (60m)	200 ft (60m)

24

Screed compaction

- Sometimes referred to as “pre-compaction”
- Vibratory screeds
 - On/off
 - Adjust frequency of vibration



25

Screed Density



- Screed develops initial density
- Vibratory screed produces compaction energy
- Tamping and vibratory screeds produce higher compaction energy

26


Vibratory screeds




- Typically 78% to 84% density
- No vibration 75 – 82%
- Set vibratory frequency correctly
- Surface texture improved

27

Mix behind the screed before rollers

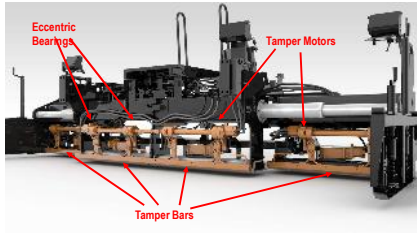


- Use screed vibration
- Initial + 0.5 to 3.0%
- What affects optimum screed vibration setting? How do I set it?



28

Tamper Bar Screens




- Set amplitude & frequency
- Approx. 84-88% TMD
- 45-120 ipf
- 8 – 15 fpm
- 2.5 – 4 m/min

29

Breakdown Compaction


- Develops the majority of the density
- Works immediately behind the paver where asphalt is the hottest
- Must match the production / speed of the paver



Breakdown

30

Good target density for breakdown $\approx 90\%$



- Job spec is 92-97%
- Job target for final density is 94%
- Goal for **breakdown compaction** is 95% of our overall target density

$0.95 \times 94\% \approx 90\%$

Theoretical Maximum Density (TMD)

31

Drum Width Considerations

Required Number of Overlapping Passes per Drum Width

Paving Width (Meters / Feet)	Drum Widths				
	140 cm (55in)	150 cm (59in)	170 cm (67in)	200 cm (79in)	213 cm (84in)
2.5 / 8	2	2	2		
2.75 / 9	3	3	2		
3.00 / 10	3	3	3	2	2
3.35 / 11	3	3	3	2	2
3.70 / 12	(4)	3	3	2	2
4.00 / 13			3	3	2
4.25 / 14			3	3	3
4.50 / 15				3	3
4.80 / 16				3	3
5.20 / 17				3	3
5.50 / 18					3

- Maximum 3 drum widths
- Narrower drums have higher PLI
- Consider production vs. ability to get density

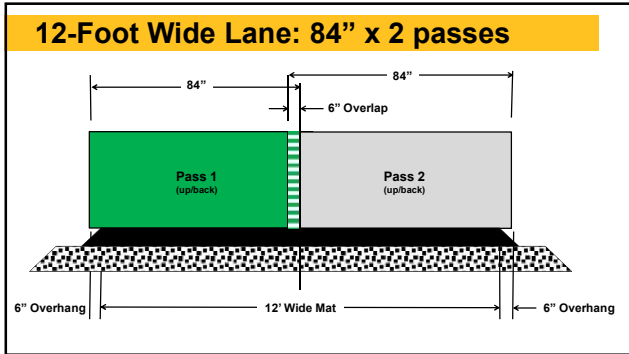
32

Typical rolling patterns



- 12' with 84" drum
- 12' with 79" drum
- 12' with 67" drum
- Make odd pass back on the wheel path

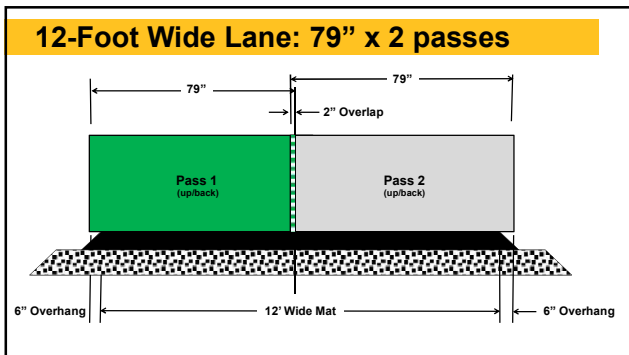
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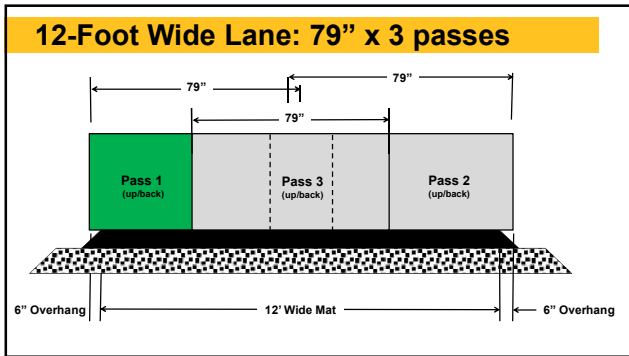
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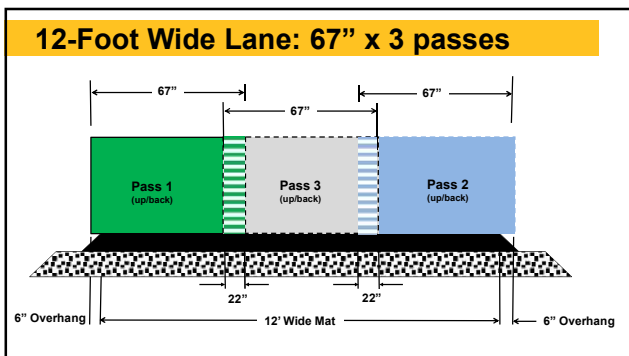
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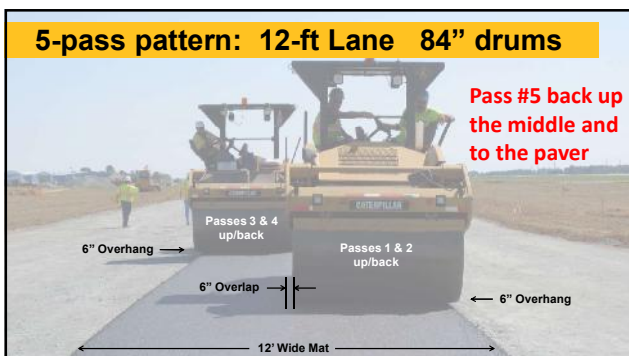
36



37




38



39

Intermediate Compaction

- Normally immediately after breakdown compaction
- Goal is to develop final target density



Breakdown Intermediate

41

Finish Compaction


- Goal is to clean up marks left by previous rollers
- Mat warm enough to allow clean up at the surface
- May get some density gain



Breakdown Intermediate Finish

42

Test Strips



- Verify equipment and patterns
- Develop required density
- First day of job
 - Sometimes required in advance
 - Don't fake it
- Communicate plan to all crew members

43

Getting More Density on the Test Strip



- Add passes
- Increase amplitude
- Increase tire pressure or ballast
- Change rollers
- Add rollers
- Work closer to the paver
- Lower working speed

44

Types of rollers

- Static steel drum
- Vibratory steel drum
- Oscillation
- Pneumatic
- Combination

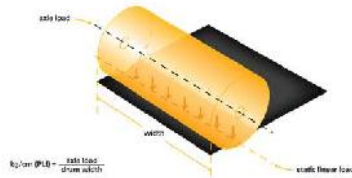


45

Static Steel Drum




- kg/m (PLI)
- Narrower drum = higher contact pressure



46

Vibratory Steel Drum

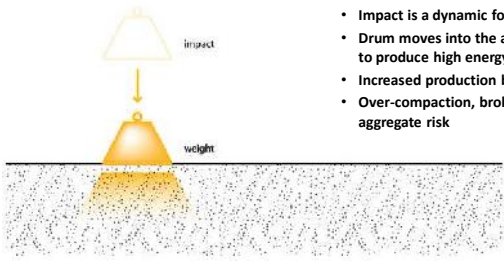


- Breakdown, intermediate and finish rolling
- Settings for amplitude and frequency
- Static mode for finish rolling

Build density from the top down

47

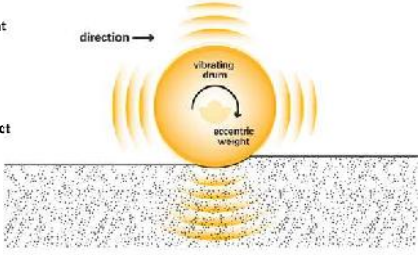
Impact Force



- Impact is a dynamic force
- Drum moves into the asphalt layer to produce high energy
- Increased production benefit
- Over-compaction, broken aggregate risk

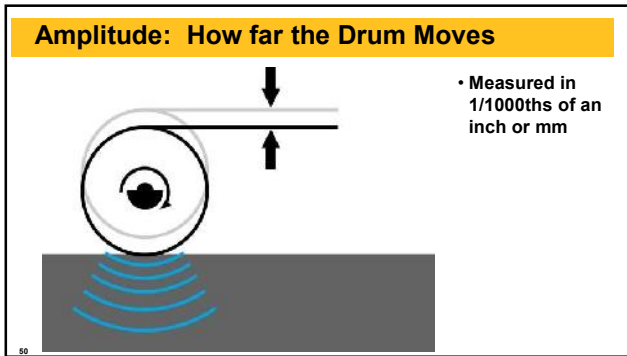
48

Vibration

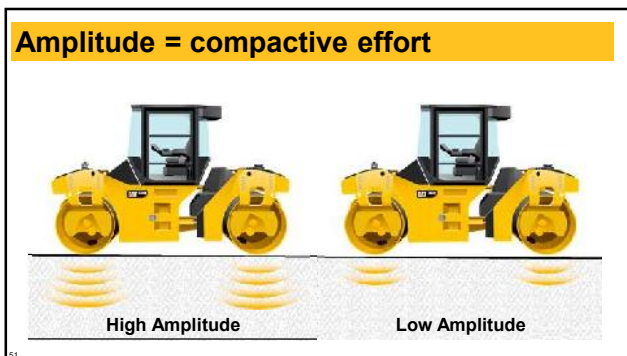


- Spinning eccentric weight causes drum vibration
- Vibratory force sets aggregates in motion
- Aggregates orient better for stone on stone contact

49



50




51

Amplitude Checklist

Factor	Lower Force 0.25 - 0.6 mm	Higher Force >0.6 mm
Layer Thickness	< 2.0 in (50mm)	> 2.0 in (50mm)
Base Support	Rigid	Flexible
Binder Viscosity	Low (unmodified)	High (modified)
Aggregate Shape	Rounded	Angular
Ambient Temperature	High	Low
Base Temperature	High	Low

52

Balanced Roller Vibration




- Optimum compaction occurs when all forces are accepted by the asphalt layer
- Balance between forces of compaction and the asphalt layer

When compaction is balanced, most of the vibratory force is carried into the mat.

53

Drum Bouncing




- Forces out of balance create drum bounce
- Inefficient operation
- Solve bouncing:
 - change speed
 - lower amplitude
 - higher frequency
 - one drum static
 - both drums static

Some compaction energy will be transferred back to the machine frame and into the rollers.

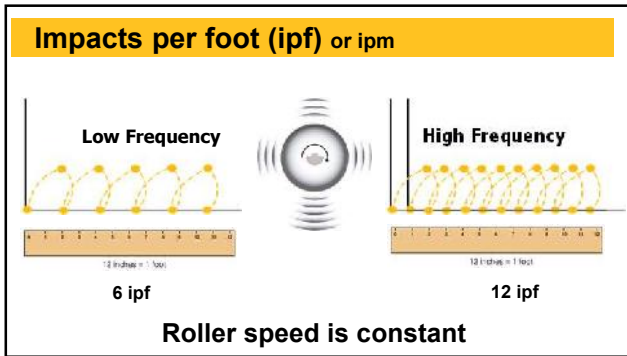
54

Frequency

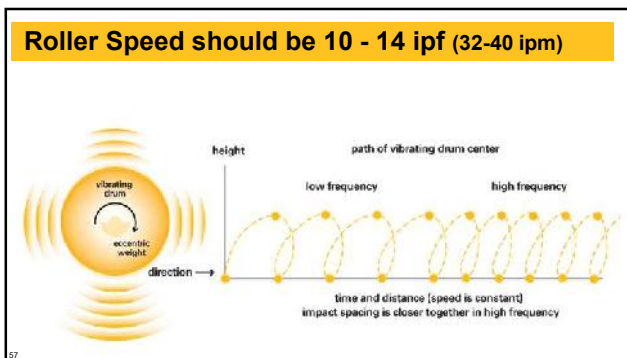


RPM of eccentric weight or shaft in drum

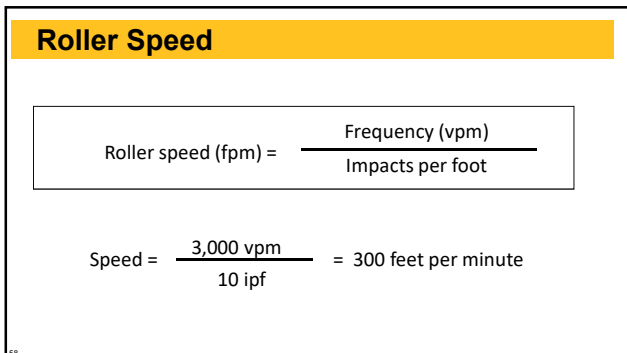
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56



57



58

Effective Roller Speed

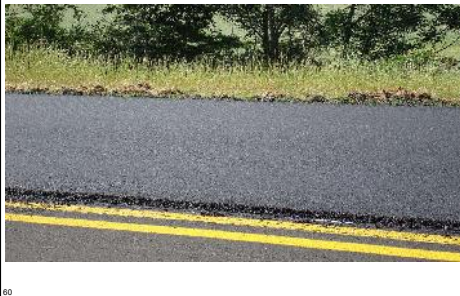
$$\text{Effective roller speed} = \frac{300 \text{ fpm}}{7 \text{ passes}} = 42 \text{ fpm}$$

$$\text{Effective Roller speed} = 42 \times 0.80 = 34 \text{ fpm}$$

Paver can not exceed 34 fpm

59

Ripples in the Mat



- ipf too low
- Speed too fast



60

Verify Roller Settings



- Is the equipment in good working condition?
- Settings per test strip?
 - Amplitude
 - Frequency
 - Speed (10-12 ipf)



61

Higher Amplitude ≈ Lower Frequency

Amplitude	Frequency
0.86 mm	2520 vpm
0.73 mm	2520 vpm
0.44 mm	3800 vpm
0.33 mm	3800 vpm

- When changing to high amplitude, frequency will be lower
- What does this mean?

62

Oscillation



- Back and forth drum movement
- Maintains contact with surface
- Less aggressive compaction

63



64

Steel Drum: Best Practices



65

Turn off vibration before stopping

- Worker safety is # 1
- Be aware of personnel around the paver
- Stop at least 15' behind paver
- Shut off vibes as roller slows down

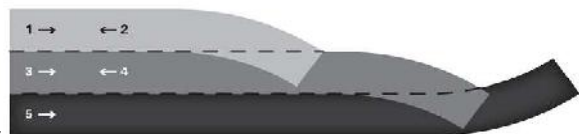


66

Stop at an angle to the mat

- Roller stops at an angle
- Turn off vibration just before roller starts turning
- Next pass rolls through stop mark
- Stop marks are staggered

REVERSING



67

Don't Stop Square to the Mat = Bump



68

Stopping Square to the Mat = Bump



69

Stop at an Angle to the Mat



- Approximately 30° arc
- Roll through stop marks on next pass with vibe on
- Drum mark will roll out

70

Don't stop in the same area – roll through



- Major smoothness issue
- Roll through stop marks with vibrate on next pass

71

Roll off onto Cold Mat When Possible



72

72

Roll off onto Cold Mat When Possible



73

73

Pick-Up On Dry Drum Surfaces

- Most common cause of downtime
- Film of water must cover drum
- Small amount of pick-up becomes big problem



74


Rolling tips



- Many mixes are prone to sticking to steel drums
- Imperative that water system is working properly
- Soap/release agent mixture

75

Parking on the Mat



- Never park on hot asphalt
- Leaves dents that will not clean up
- Park on cold asphalt
- Park on shoulder, if available

76

Stopping for Water Refill



- Plan water refill stops
- Stop on shoulder or turnout or cold asphalt – never on driving lane
- Make sure water hose is long enough for all situations

77

Stopping for Water Refill

If necessary, use boards to allow roller to get off hot asphalt during water refills



78

Rolling with steel drums



- Should I use vibration?
- Careful not to break aggregate
- How do I avoid breaking aggregate?

79


Get on, get off !!



- It's easy to over-roll and damage the mat using vibration
 - It's also more efficient to use vibration
- Watch for 'drum bounce'
- Watch for white surface

80

Vibratory Drum Impact Marks



- Too much force
- Cannot use roller to correct height mismatch!

81

Recommendations:

- Static steel on thinner lifts with rigid base support
- Use vibration on thicker lifts, less rigid base
 - use vibration whenever possible where it doesn't fracture aggregate
 - the only way to know is to try!!
 - highly temperature dependent
- Oscillation may work in any position
 - less risk of damaging/fracturing aggregates
 - more risk of not achieving density
- Pneumatic tire should not be used on PMA due to pickup

82

Don't Roll Over the Crown!



- Be careful not to roll over the crown – daylight under both drums ☹
- Roll low side to high side

83

Unsupported edge 6" overhang



84


First Pass on Unsupported Edge



85

Pneumatic Rollers

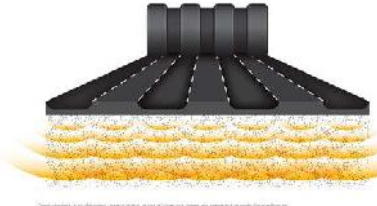
- Most commonly used for intermediate rolling
- Knead the mix
- Close up surface voids and tension cracks
- Efficient building density



Build density from the bottom up

86

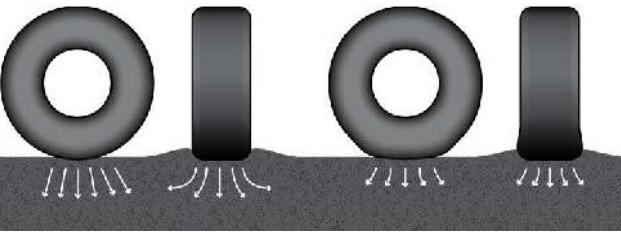
Manipulation or kneading action



- Manipulation occurs due to overlapping tires
- Some forces move sideways
- Tightens surface texture

87

Adjusting Tire Pressures



Higher Pressure Lower Pressure

88

Pneumatic Roller: Best Practices

- Do not turn
- Stop slowly
- Finish roller clean up marks
- Tricky using modified binders



89

Keep Off the Unsupported Edge



90


Avoid Pick-Up On Rubber Tires

- Use approved release agent
- Keep tires within 40°F of mat
- Keep moving



91


Keep Tire Pressures Equal



- Warm up before rolling
- Keep tires hot
- Tire pressures equal

92

Establish an effective rolling pattern



1. Based production and density
2. Equipment Selection
- ↕ Decision Point
3. Balance paver & roller speed
- ↕ Decision Point
4. Test Strip
5. Verify during production

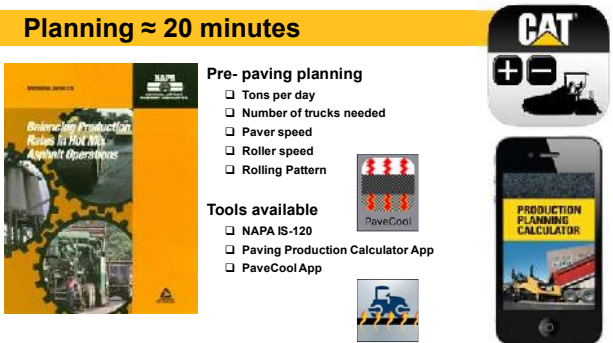
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5-Steps to Establishing a Rolling Pattern

1. Schedule a full time QC person to do a Test Strip
2. Know the target paver speed
3. Target 95% of final density for the breakdown roller(s)
4. Perform Test strip
 - Determine number of passes required for each roller
 - Record the roller settings of Amplitude & Frequency
 - Know the Time Available for Compaction (PaveCool)
 - 10 impacts per foot for density & smoothness
 - Roller distance behind the paver and each other
5. Check, check, check! and adapt as conditions change

94

Planning ≈ 20 minutes



Pre-paving planning

- Tons per day
- Number of trucks needed
- Paver speed
- Roller speed
- Rolling Pattern

Tools available

- NAPA IS-120
- Paving Production Calculator App
- PaveCool App

95

Example: Overlay Job

- Bid 2,500 tons/day (300 tph plant)
- 8-hr paving window
- End dumping (18-ton)
- 12-ft wide, unconfined edges
- 2-inch overlay
- 12.5mm polymer-modified mix
- Autumn < 70°F
- Given 3 rollers
 - 84" steel vibratory (Cat CB64)
 - 79" steel vibratory (Cat CB54XW)
 - 82" pneumatic (Cat CW34)



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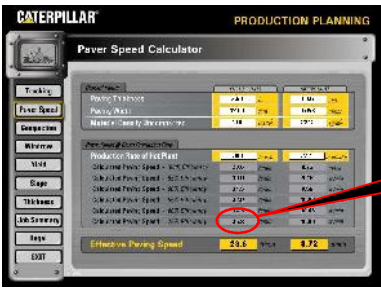
Step 1: Call to schedule a QC Person

1. TMD of the mix
2. Nuke gauge
3. Coring rig
4. Infrared thermometer
5. List of rollers
6. Know amp & freq settings
7. Notepad
8. Lunch



97

Paver speed = 36 fpm



- Use 75% efficiency for end-dumping
- Use 100% for MTV

101

Paver Speed, trucking & plant is balanced




Continuous paving at 36 fpm on this job will deliver 2,500 tons over 8 hours

102

Step 3: Density target for breakdown

- Job spec is 92-97%
- Target for final density is 94%
- Goal for breakdown compaction is 95% of final target density

$0.95 \times 94\% \approx 90\%$



103

Step 4: Test Strip

1. Number passes
2. Amplitude & Frequency
3. 10 impacts per foot
4. Time Available for Compaction
5. Roller distance behind the paver



104

Choose Amplitude

Versa Vibe™ Vibratory System

CB64

Frequency: 42 Hz (2,520 vpm)		CB54		CB54 XV		CB64	
Nominal Amplitude							
High	0.86 mm	0.034 in	0.75 mm	0.031 in	0.67 mm	0.026 in	0.026 in
Low	0.75 mm	0.029 in	0.66 mm	0.026 in	0.57 mm	0.022 in	0.022 in
Centrifugal Force Per Drum							
High	88.8 kN	19,980 lb	88.8 kN	19,980 lb	88.8 kN	19,980 lb	19,980 lb
Low	75.4 kN	16,965 lb	75.4 kN	16,965 lb	75.4 kN	16,965 lb	16,965 lb
Frequency: 63.3 Hz (3,800 vpm)							
Nominal Amplitude							
High	0.44 mm	0.017 in	0.40 mm	0.016 in	0.34 mm	0.013 in	0.013 in
Low	0.35 mm	0.013 in	0.30 mm	0.012 in	0.26 mm	0.010 in	0.010 in
Centrifugal Force Per Drum							
High	103.3 kN	23,243 lb	103.3 kN	23,243 lb	103.3 kN	23,243 lb	23,243 lb
Low	77.5 kN	17,438 lb	77.5 kN	17,438 lb	77.5 kN	17,438 lb	17,438 lb

105

Choose Frequency

Versa Vibe™ Vibratory System

CB64

Frequency: 42 Hz (2,520 vpm)		CB54		CB54 XV		CB64	
Nominal Amplitude							
High	0.86 mm	0.034 in	0.75 mm	0.031 in	0.67 mm	0.026 in	0.026 in
Low	0.75 mm	0.029 in	0.66 mm	0.026 in	0.57 mm	0.022 in	0.022 in
Centrifugal Force Per Drum							
High	88.8 kN	19,980 lb	88.8 kN	19,980 lb	88.8 kN	19,980 lb	19,980 lb
Low	75.4 kN	16,965 lb	75.4 kN	16,965 lb	75.4 kN	16,965 lb	16,965 lb
Frequency: 63.3 Hz (3,800 vpm)							
Nominal Amplitude							
High	0.44 mm	0.017 in	0.40 mm	0.016 in	0.34 mm	0.013 in	0.013 in
Low	0.35 mm	0.013 in	0.30 mm	0.012 in	0.26 mm	0.010 in	0.010 in
Centrifugal Force Per Drum							
High	103.3 kN	23,243 lb	103.3 kN	23,243 lb	103.3 kN	23,243 lb	23,243 lb
Low	77.5 kN	17,438 lb	77.5 kN	17,438 lb	77.5 kN	17,438 lb	17,438 lb

106

Frequency Determines Roller Speed

Frequency = 2,520 vpm
 We want 10 impacts per foot

$$\frac{2,520}{10} = 252 \text{ fpm}$$

107

Number passes Breakdown CB64

		Breakdown CB64		Intermediate	Finish CB54-XW
		12-ton		14-ton tire	10-ton
Settings		Amp 0.022'	Freq 2,520	90 psi	
1 st Pass	Temp	280F (138C)			
	Density	88%			
2 nd Pass	Temp	260 (127)			
	Density	90%			
3 rd Pass	Temp	252 (122)			
	Density	91%			
4 th Pass	Temp				
	Density				

108

"Effective" Roller Speed

• Drum width
 • Number of passes

40 fpm
 40 fpm > 36 fpm

109

How far back from the Paver should I be ?

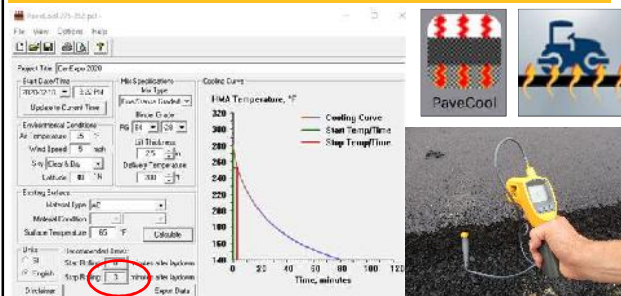


- Roller distance behind the paver depends on how fast the mat is cooling down!
- Temperature, temperature, temperature!!!

Speed = $\frac{\text{Distance}}{\text{Time}}$

110

Cooling Time from 280°F (138°C) to 252°F (122°C)



111

Length of the Breakdown Roller Pass

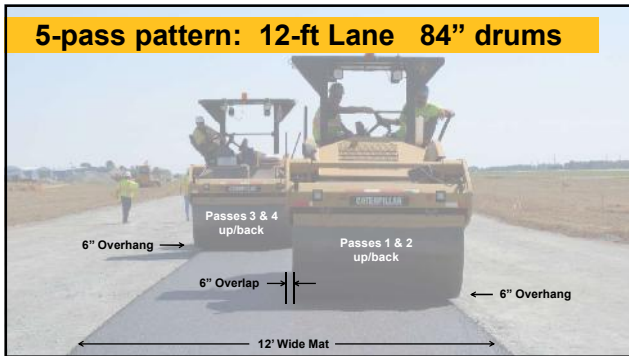
Roller Speed = $\frac{\text{Frequency (vpm)}}{10 \text{ ipf}} = \frac{2,520}{10} = 252 \text{ fpm}$

Time = 3 minutes

Speed = $\frac{\text{Distance}}{\text{Time}}$

Distance = Speed x Time
 = 252 x 3
 = **756 ft (in 3 minutes)**

112



113





Length of the Breakdown Roller Pass

756 feet traveled in 3 minutes
 We have a 5-pass pattern (from test strip) to cover the mat twice
 $756 \div 5 \text{ pass pattern} = 151 \text{ feet}$
 Assume 80% roller efficiency
 $151 \times 0.80 = 121 \text{ feet}$
 Length of roller pass = **120 feet (36m)**

Note: If temperatures change – the length of roller pass changes!!

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Step 4: Rolling Pattern Summarized

	Breakdown	Intermediate	Finish
%TMD	90-92%	90-94% ??	94%+ take out marks
			
Temp	280 - 252 F (138-122 C)	??	??
Coverage	2 (5-pass pattern)	??	??
Settings	High A, Low F	90 psi	???
Distance	← 36m (120 feet) →	← ??? →	← ??? →
Speed	4.6 km/h (252 fpm)	???	???

115

Step 4: Repeat for all Rollers



- Busy!!!
- Everyone's watching!

116

Number passes Intermediate CW34

		Breakdown CB64	Intermediate CW34	Finish CB54-XW
		12-ton	14-ton tire	10-ton
Settings		Amp Freq 0.022" 2,520	90 psi	
1 st Pass	Temp	280F (138C)	252 (122)	
	Density	88%	92%	
2 nd Pass	Temp	260 (127)	245 (118)	
	Density	90%	93%	
3 rd Pass	Temp	252 (122)	230 (110C)	
	Density	91%	93.5%	
4 th Pass	Temp			
	Density			

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Number passes - Finish CB54-XW

		Breakdown CB64	Intermediate CW34	Finish CB54-XW
		12-ton	14-ton tire	10-ton
Settings		Amp Freq 0.022" 2,520	90 psi	1 vibrate, low A (0.012"), high F (3,800 vpm), 1 static
1 st Pass	Temp	280F (138C)	252 (122)	200 (93)
	Density	88%	92%	94% (vibe)
2 nd Pass	Temp	260 (127)	245 (118)	163 (73)
	Density	90%	93%	94% (static)
3 rd Pass	Temp	252 (122)	230 (110C)	
	Density	91%	93.5%	


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Final Rolling Pattern						
		Breakdown CB64		Intermediate	Finish CB54-XW	
		12-ton		14-ton tire	10-ton	
Settings		Amp	Freq	90 psi	Amp	Freq
		0.022"	2,520 vpm		0.012"	3,800 vpm
1 st Pass	Temp	280F (138C)		252 (122)	200 (93)	
	Density	88%		92%	94% (vibe)	
2 nd Pass	Temp	260 (127)		245 (118)	163 (73)	
	Density	90%		93%	94% (static)	
3 rd Pass	Temp	252 (122)		230 (110C)		
	Density	91%		93.5%		
4 th Pass	Temp					
	Density					

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Step 4: Final Rolling Pattern			
	Breakdown	Intermediate	Finish
%TMD	90-92%	92-94%	94% + take out marks
			
Temp	280-252° F (138-122° C)	252-230° F (122-110° C)	200-163° F (93-73° C)
Coverage	2 (5-pass pattern)	3 (7-pass pattern)	2 (1 vibe/1+ static)
Settings	High A, Low F	90 psi	Low A, High F, static
Distance	← 120 feet →	← 200 feet →	← 200 feet →
Speed	252 fpm	300 fpm	350 fpm

120

Step 5: Check, Check, Check	
	<ul style="list-style-type: none"> • Be prepared to make changes if conditions change • Let Foreman and operators know

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Each Project is Different

- Each project requires analysis
- Meeting end result specifications requires planning and communication



122

Efficient Compaction of Stiff & Tender mixes

Stiff mixes

- Stable and can take high compactive forces
- Compact easier at higher temperatures
- Use higher amplitudes

Tender mixes

- Temperature sensitive through a specific temperature range
- Achieve density before tender zone by rolling in echelon **OR**
- Wait until mix cools below tender zone and resume rolling

123

Echelon breakdown - no finish required



- Get density while it's hot!
- Sets up quickly
- Often no need for finish rolling with echelon rolling

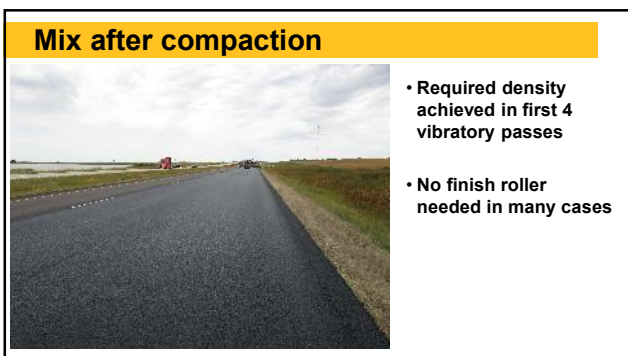
124



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127

Echelon - pneumatics



128

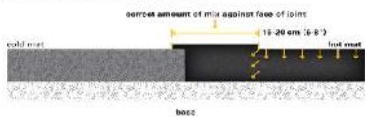
Longitudinal Joint: Roll from hot side



129

Best Joint Density

FIRST PASS FOR HIGHER JOINT DENSITY



- First pass on hot side 6 - 8" away from joint
- Pushes asphalt toward the joint to help gain density

130



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132



133

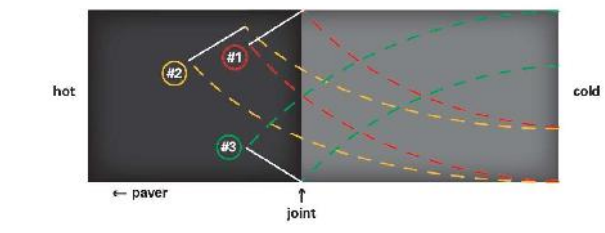
Transverse Joint Rolling Patterns



- Breakdown roller starts normal pattern
- Paver should not have to stop and wait for joint to be prepared and compacted

134

Transverse Joint Rolling Pattern



hot ← paver joint → cold

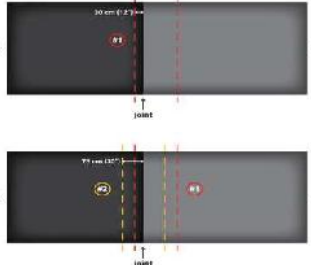
135

Transverse Joint Rolling Pattern



136


Transverse Joint Rolling Pattern



- 1st pass most of drums on cold side
- Check flatness
- 2nd pass, move farther onto hot side
- All passes static
- Should not have to vibrate to pinch a transverse joint

137

Tender Mix



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Rolling tender mixes



- Does not compact in specific temperature range or zone
- Roll in echelon
- Resume compaction below tender zone temp
- Do NOT run a steel drum in the tender zone

139

Top 5: Checklist for Compaction

1. Mix behind the screed is hot
2. Breakdown roller should cover mat in 3 drum widths or less
3. Breakdown roller speed is 10 ipf (10 - 14)
4. Balance roller speed with paver speed
5. Goal: Breakdown roller achieves $\approx 95\%$ of target density
 - e.g. $0.95 \times 94 \approx 90\%$ (TMD)

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Who's responsibility is it?

- Paver Speed?
 - Paver operator?
- Roller Speed?
 - Roller operator?
 - Quality Control?
- Meeting Density & Smoothness targets.
 - Quality Control?



141

Plan for Excellent Compaction!



- Set paver speed
- Set target density
- Set roller speed to paver
- Do a Test Strip
- Check, check, check...
- Work as a TEAM!

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**Thank-you for your attention!
Questions?**



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