



Commercial Parking Lots

Best Practices in Design and Construction

62nd Annual NJ Asphalt Paving Conference

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Acknowledgements

- ▶ With Grateful Thanks to:
 - Dan Staebell, Northcentral Regional Director, Asphalt Pavement Alliance
 - Mike Huner, Huner Consulting LLC

Have you ever heard this?

It's just a
parking lot!



Total Tons

Table 3: Summary of 2017 Estimated and Reported Asphalt Mixture Tons in Each State

State	Tons, Millions		Reported % of Estimated	State	Tons, Millions		Reported % of Estimated
	Estimated	Reported			Estimated	Reported	
Alabama	7.0	4.9	70%	Montana	4.2	*	*
Alaska	5.1	*	*	Nebraska	2.8	0.5	18%
American Samoa	0.03	*	*	Nevada	3.4	1.3	38%
Arizona	6.5	1.2	18%	New Hampshire	3.0	2.5	83%
Arkansas	6.0	1.9	32%	New Jersey	10.2	4.0	39%
California	26.0	5.9	23%	New Mexico	3.0	0.9	30%
Colorado	5.3	2.0	38%	New York	16.5	7.3	44%
Connecticut	4.9	2.8	57%	North Carolina	16.0	6.4	40%
Delaware	1.5	*	*	North Dakota	2.7	1.2	44%
District of Columbia	1.4	*	*	Ohio	14.8	11.6	78%
Florida	16.5	4.6	28%	Oklahoma	4.8	2.4	50%
Georgia	14.6	2.2	15%	Oregon	5.4	1.4	26%
Hawaii	1.1	0.8	73%	Pennsylvania	19.8	7.7	39%
Idaho	2.8	1.7	61%	Puerto Rico	1.6	NCR	NCR
Illinois	13.0	2.1	16%	Rhode Island	2.0	*	*
Indiana	11.8	6.6	56%	South Carolina	7.6	3.9	51%
Iowa	3.9	1.6	41%	South Dakota	2.0	*	*
Kansas	2.0	1.1	55%	Tennessee	9.2	2.5	27%
Kentucky	4.4	4.4	100%	Texas	20.0	7.9	40%
Louisiana	7.8	1.2	15%	Utah	4.0	3.5	88%
Maine	1.7	2.0	118%	Vermont	1.9	*	*
Maryland	7.8	2.4	31%	Virginia	12.0	4.9	41%
Massachusetts	6.5	5.0	77%	Washington	6.0	4.5	75%
Michigan	13.7	9.0	66%	West Virginia	2.6	1.5	58%
Minnesota	6.9	6.0	87%	Wisconsin	12.0	8.7	73%
Mississippi	4.8	2.8	58%	Wyoming	2.5	0.1	4%
Missouri	6.5	3.9	60%	Total	379.4	163.0†	43%

NCR No Companies Responding

* Fewer than 3 Companies Reporting

† Total Reported Tons includes values from state with fewer than 3 Companies Reporting

SAPA Estimated Tons

Numbers do not add up exactly due to rounding

Asphalt Pavement
Industry Survey on
Recycled Materials and
Warm-Mix Asphalt Usage
2017
Information Series 138

USA Asphalt Tons

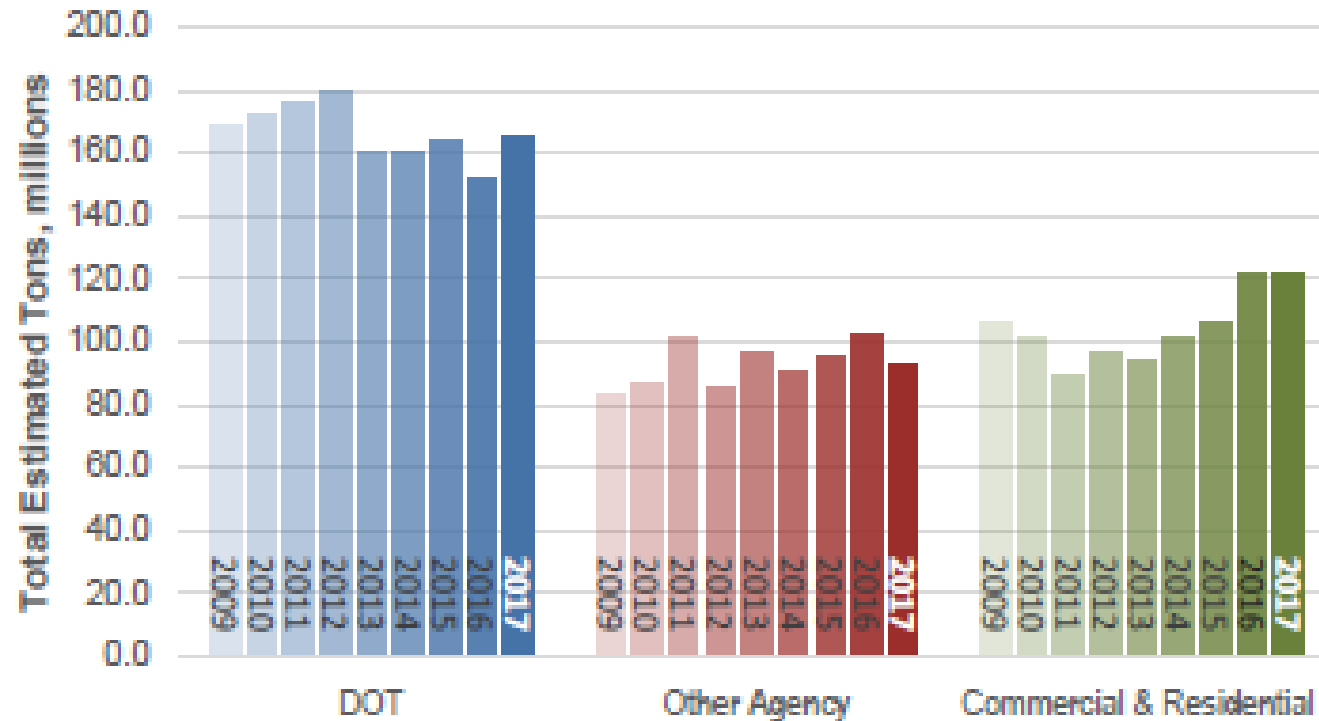


Figure 2: Estimated Total HMA/WMA Asphalt Mixture Production by Sector, 2009–2017

Asphalt Pavement
Industry Survey on
Recycled Materials and
Warm-Mix Asphalt Usage
2017
Information Series 138

Big NEED

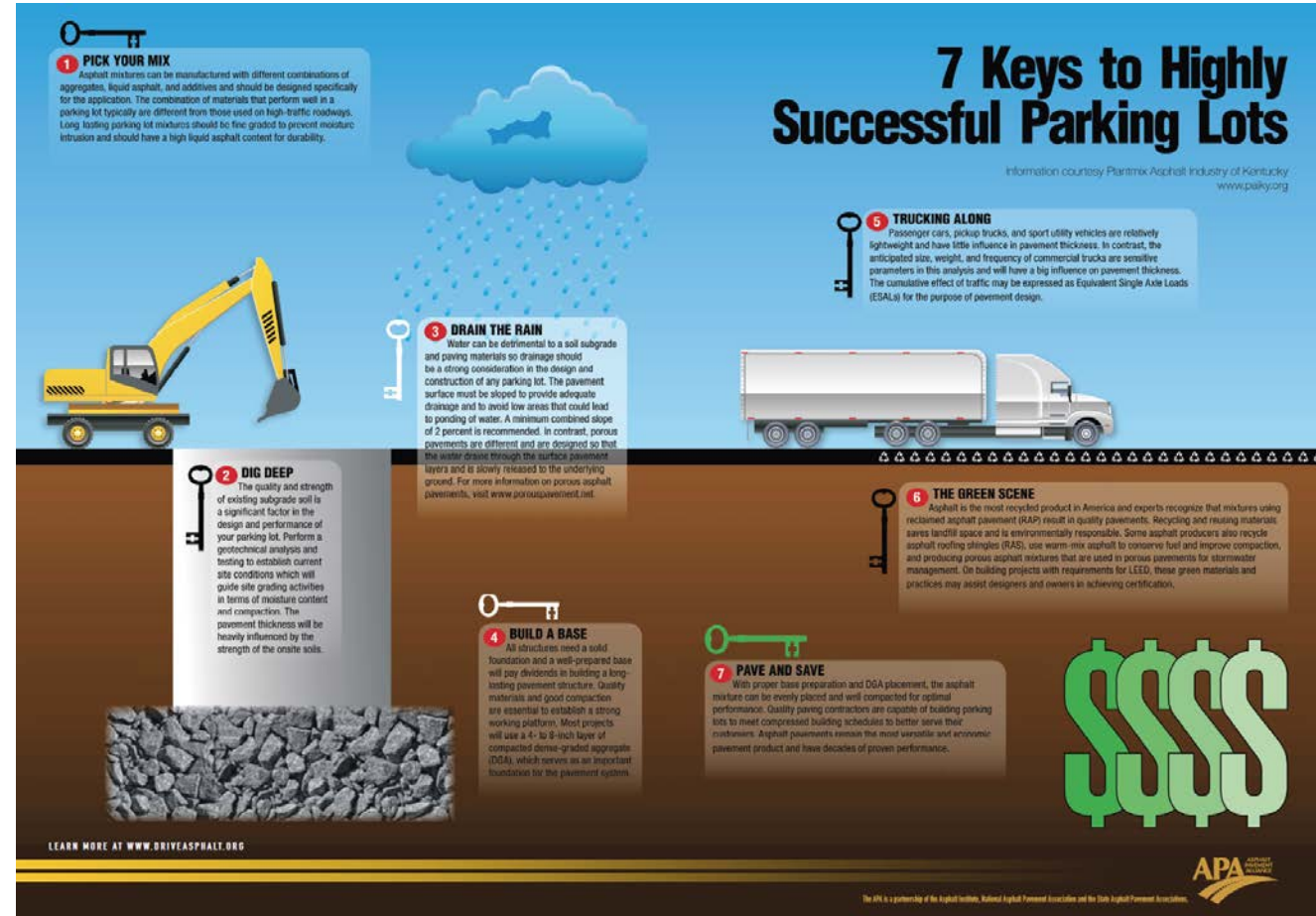
- ▶ 250 million registered light vehicles (car, light trucks and motorcycles) in the United States.
- ▶ 4 – 8 parking spaces per vehicles in this country
- ▶ That means we have between 1 billion and 2 billion parking spaces in America alone
- ▶ An area equivalent to the size of Connecticut...



7 Keys

- Pick your Mix
- Dig Deep
- Drain the Rain
- Build a Base
- Trucking Along
- The Green Scene
- Pave and Save

Pay attention to details



Pick your Mix

- ▶ Parking vs. Highway
 - Static
 - Rolling
- ▶ Dense Graded (9.5mm?) or
- ▶ Porous (OGFC)



Pick your Mix

- ▶ Understand Asphalt Cement – Binder
 - Proper % Binder
 - Performance Grade (PG)
 - Ask for guidance!
 - Physical Location of Use
 - Base or Surface
 - Polymer additives
- ▶ **Warning:** Improper Selection can result in:



Just Right!

RAP Percent Use

- ▶ Manage Percentage
- ▶ Liquid Binder
- ▶ Mix Design = Performance

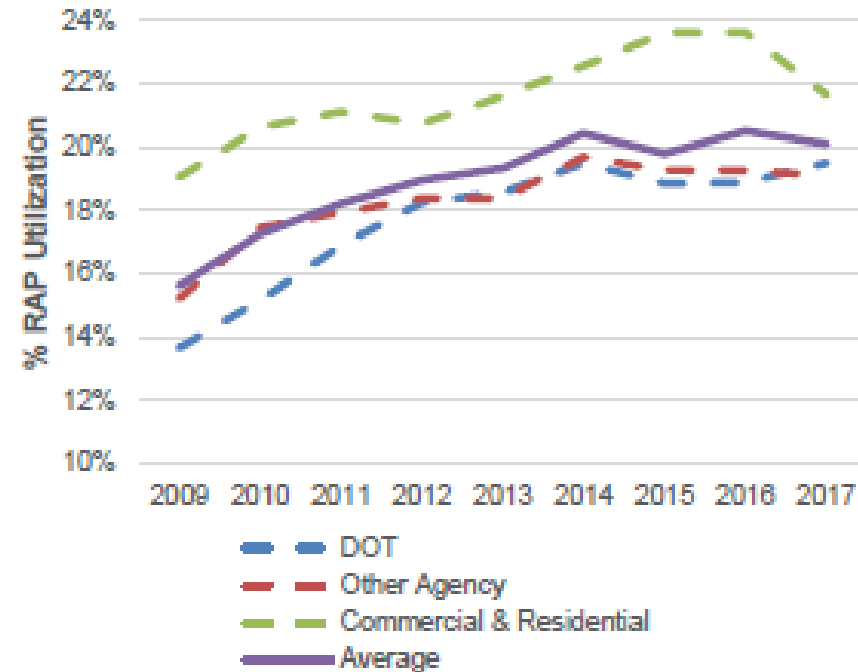


Figure 5: Average Percent RAP Used by Sector

Dig Deep

- ▶ Subbase Platform
 - Understanding Support = Critical Part of Design



Drain the Rain

- ▶ Moisture Bad
- ▶ Drainage System
- ▶ *“Pay me now or Pay me later”*
- ▶ *Success starts from the ground up!*



Build A Base

- Structural Platform
- Paving Platform
- Type and Technique





Critical Pavement Design Loading and Pavement ESAL's

Trucking Along

Type of facility and vehicle types	Maximum trucks per month (one lane)	Traffic class	Design period (years)	Design ESALs
Residential driveways, parking stalls, parking lots for autos and pickup trucks.	<1	Class I	5 10 15 20	3,000 3,000 5,000 7,000
Residential streets without regular truck traffic or city buses; traffic consisting of autos, home delivery trucks, trash pickup, occasional moving vans, etc.	60	Class II	5 10 15 20	7,000 14,000 20,000 27,000
Collector streets, shopping center delivery lanes; up to 10 single-unit or 3-axle semi-trailer trucks per day or equivalents; average gross weights should be less than the legal limit.	250	Class III	5 10 15 20	27,000 54,000 82,000 110,000
Heavy trucks; up to 75 fully loaded 5-axle semi-trailer trucks per day; equivalent trucks in this class may include loaded 3-axle and 4-axle dump trucks, gross weights over 40,000 lbs.	2200	Class IV	5 10 15 20	270,000 540,000 820,000 1,100,000

Thickness Design Guides



PaveXpressdesign.com

This is a screenshot of the PaveXpress website. At the top, the PaveXpress logo is on the left, and a "Logout" button is on the right. Below the logo is the text "PAVEInstruct Pavement Design Education". The main banner image shows a winding asphalt road through a wooded area. Below the banner, the heading "Learning Pavement Design with PaveXpress" is followed by a paragraph of text. At the bottom, there are two columns: "PAVEInstruct Instruction" with a "Learning Center" button, and "PAVEExpress Design" with a "Learn More" button.

Asphalt.

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The Green Scene



- Asphalt Pavement #1 Recycled Material
- RAP = Recycled Asphalt Pavement
 - Resources Saved / 100% Reusable
 - Aggregate
 - Binder
- LEED v4
- EPD's = Environmental Product Declarations

LEEDv4 USGBC

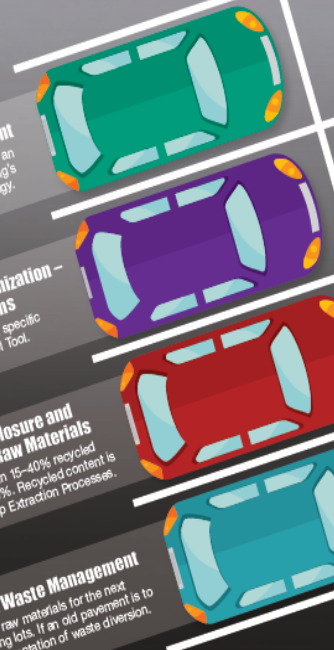
- ▶ 1–3 Points
- ▶ Recycle
- ▶ Storm Water
- ▶ EPD's





**Asphalt Pavements
&
LEED v4**

Asphalt offers sustainability benefits across the entire life cycle of a pavement — from production to placement, during in-use, and at end of life. As the most consistently recycled material in the U.S., asphalt has a proven track record of utilizing post-consumer recycled content. But it's not just about recycling.


Here are some of the ways asphalt pavements can help contribute to a project's LEED credits¹:



- 3 Points** **SSc Rainwater Management**
Porous asphalt pavements can be an important component of a building's stormwater management strategy.
- 1 Point** **MRC Building Product Disclosure and Optimization – Environmental Product Declarations**
Asphalt mix suppliers can readily develop product specific Type III EPDs using NAPA's Emerald Eco-Label Tool.
- 1 Point** **MRC Building Product Disclosure and Optimization – Sourcing of Raw Materials**
Asphalt pavements commonly contain 15–40% recycled content, and sometimes as high as 100%. Recycled content is recognized under Option 2, Leadership Extraction Processes.
- 2 Points** **MRC Construction and Demolition Waste Management**
Every new asphalt pavement contains the raw materials for the next generation of roads, runways, trails, and parking lots. If an old pavement is to be removed, the contractor can provide documentation of waste diversion.



Asphalt — Performance for a Lifetime
www.AsphaltPavement.org/sustainability



¹Credits listed here are available under LEED v4 BD+C: New Construction. Specific credits for other LEED programs may vary.
SSc = Sustainable Sites credit; MRC = Materials & Resources credit

Emeral

NAPA
NATIONAL ASPHALT
PAVEMENT ASSOCIATION



Watch on youtube.com

CC BY-ND YouTube



Pave and Save

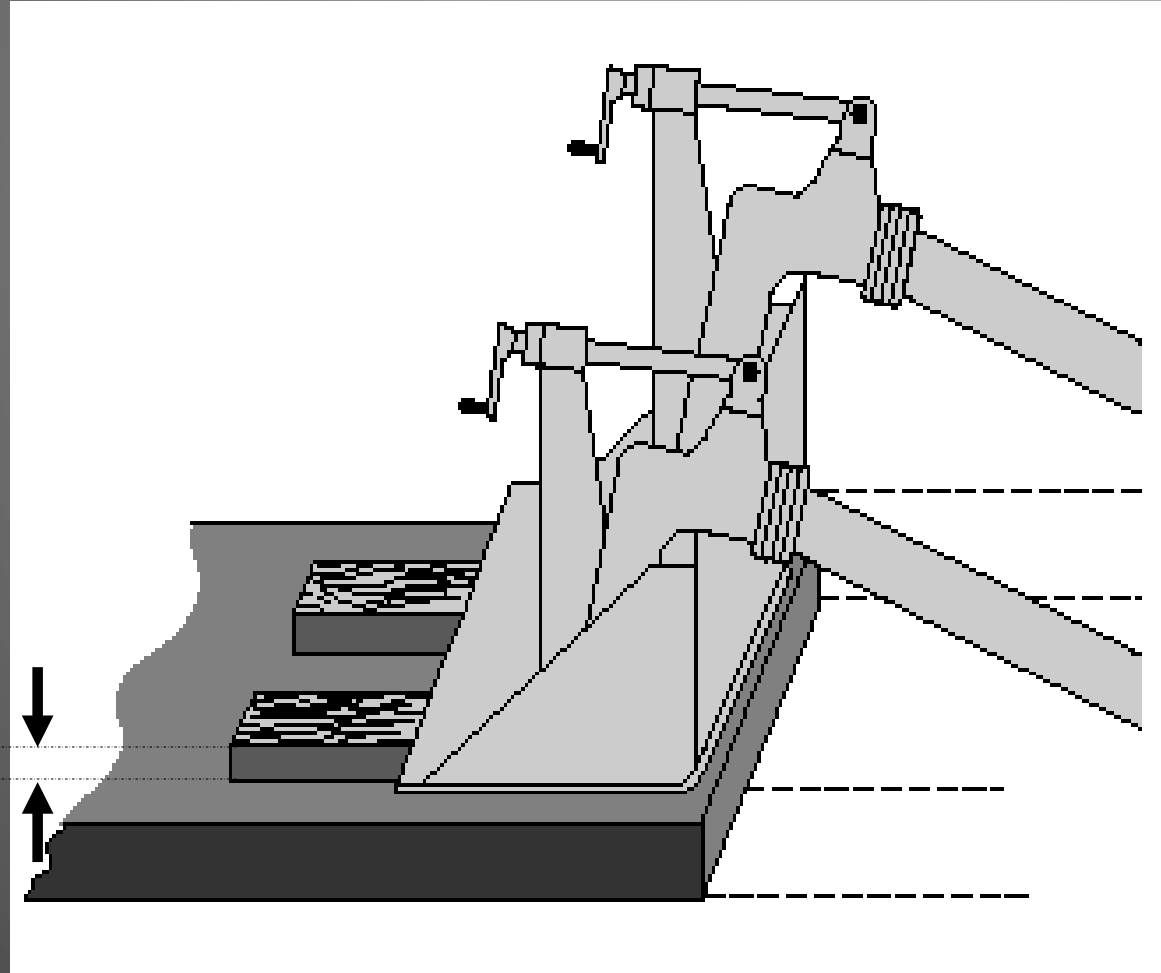
Pave and Save



- ▶ Select Qualified Contractor
- ▶ Pay Attention to Details
 - Milling?
 - Tack Coat
 - Laydown
 - Compaction
- ▶ Inspect – Inspect – Inspect
 - Oversight = Sleep like a baby!
- ▶ Ask Questions

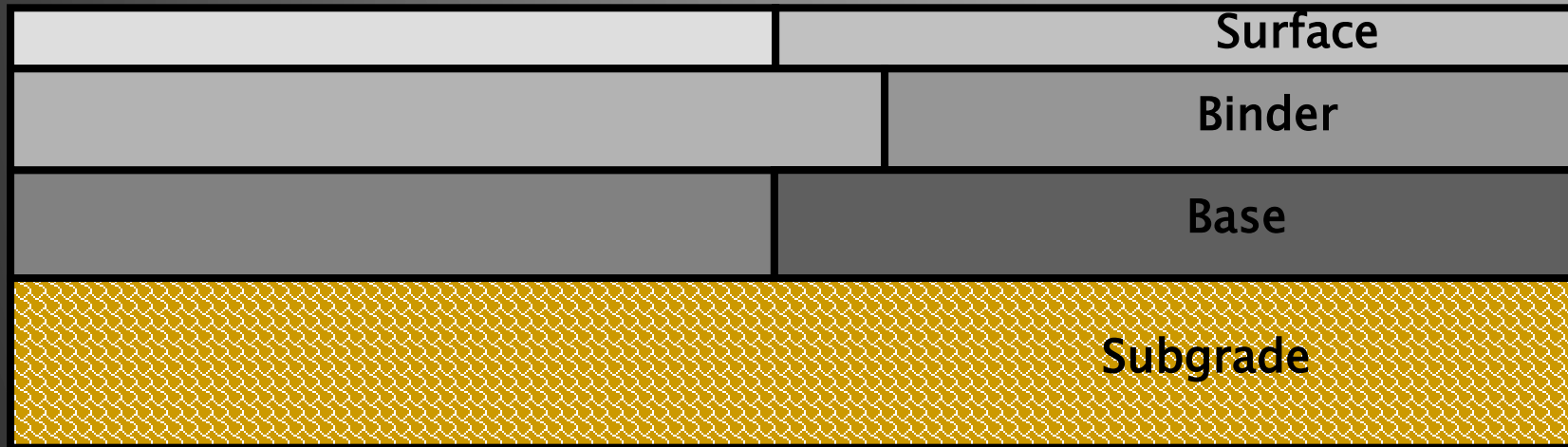
Roll-down = 25%
of compacted
thickness

Starting Blocks



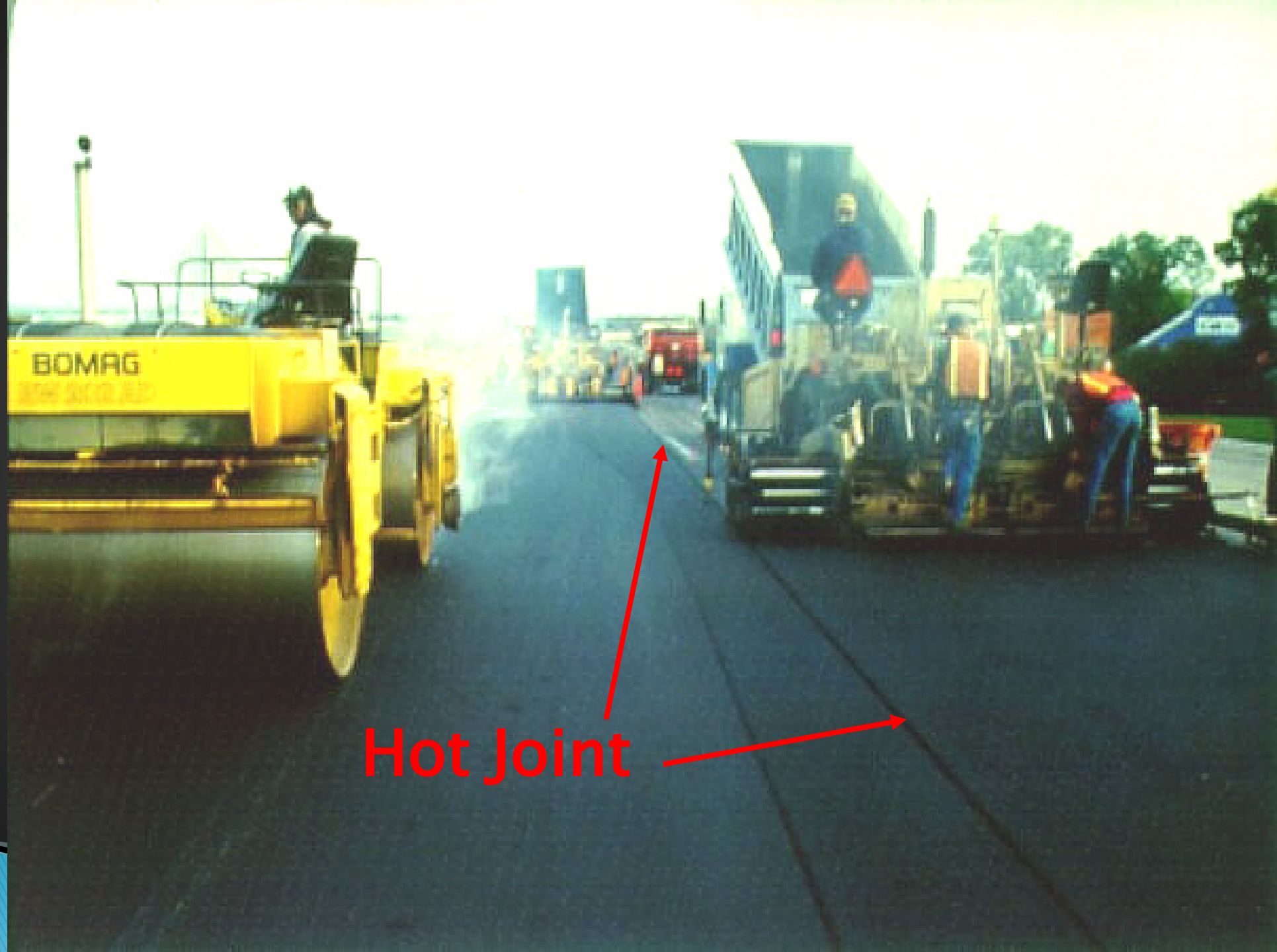
Staggered Paving Joints

6 to 12 inches



Joint Alignment

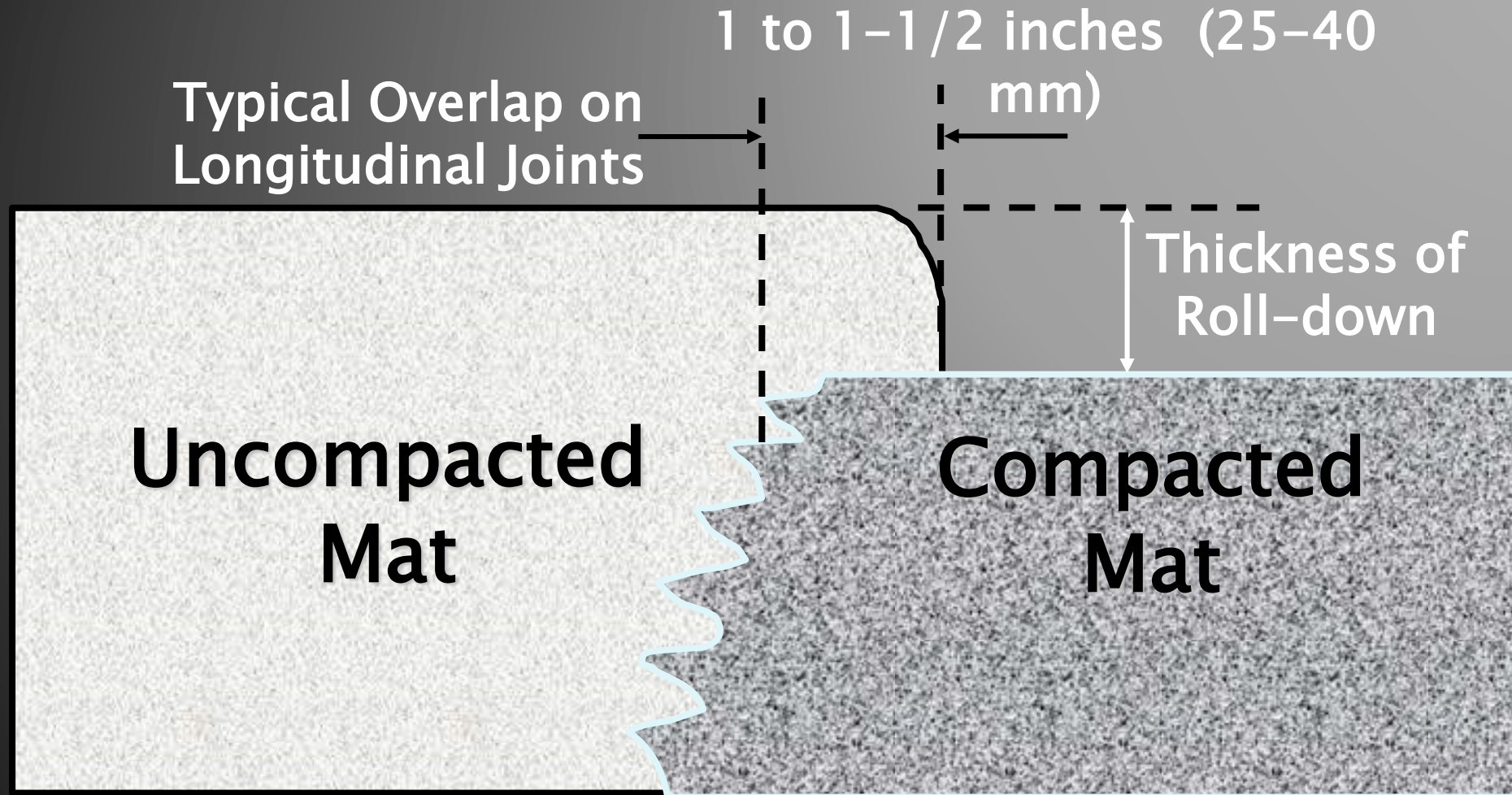




Steer a Straight Line

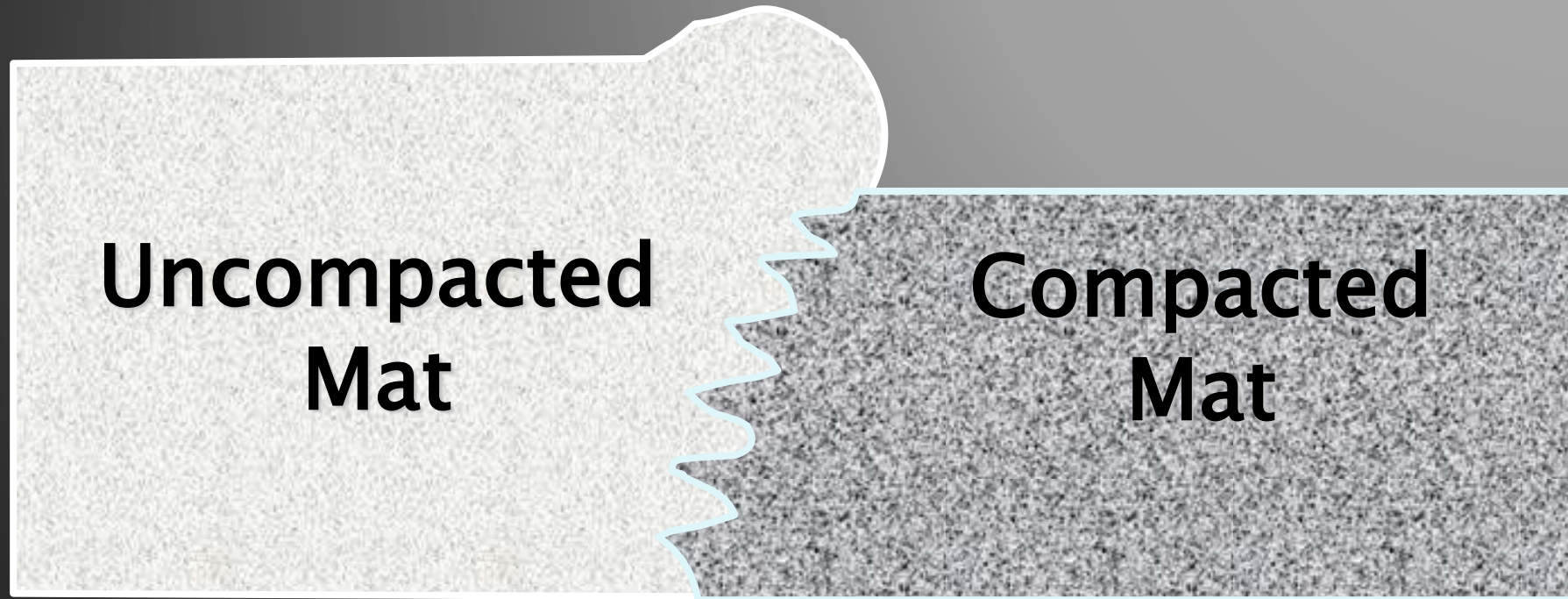


Proper Joint Construction



Proper Joint Construction

Mix “Bumped Back” over Joint



Proper Joint Construction

“Bump” the mix, Don’t “cast” it!



Recap

- Pick your Mix
- Dig Deep
- Drain the Rain
- Build a Base
- Trucking Along
- The Green Scene
- Pave and Save

Pay attention to details

7 Keys to Highly Successful Parking Lots

Information courtesy of the Asphalt Pavement Industry of Kentucky
www.pavky.org

- 1 PICK YOUR MIX**
Asphalt mixtures can be manufactured with different combinations of aggregates, liquid asphalt, and additives and should be designed specifically for the application. The combination of materials that performs well in a parking lot typically are different from those used on high-traffic roadways. Long-lasting parking lot mixtures should be fine graded to prevent moisture intrusion and should have a high liquid asphalt content for durability.
- 2 DIG DEEP**
The quality and strength of existing subgrade soil is a significant factor in the design and performance of your parking lot. Perform a geotechnical analysis and testing to establish current site conditions which will guide site grading activities in terms of moisture content and compaction. The pavement thickness will be heavily influenced by the strength of the native soils.
- 3 DRAIN THE RAIN**
Water can be detrimental to a soil subgrade and paving materials so drainage should be a strong consideration in the design and construction of any parking lot. The pavement surface must be sloped to provide adequate drainage and to avoid low areas that could lead to ponding of water. A minimum combined slope of 2 percent is recommended. In contrast, porous pavements are different and are designed so that the water drains through the surface pavement layers and is slowly released to the underlying ground. For more information on porous asphalt pavements, visit www.porouspavement.net.
- 4 BUILD A BASE**
All structures need a solid foundation and a well-prepared base will pay dividends in building a long-lasting pavement structure. Quality materials and good compaction are essential to establish a strong working platform. Most projects will use a 4- to 8-inch layer of compacted dense-graded aggregate (DGA), which serves as an important foundation for the pavement system.
- 5 TRUCKING ALONG**
Passenger cars, pickup trucks, and sport utility vehicles are relatively lightweight and have little influence in pavement thickness. In contrast, the anticipated size, weight, and frequency of commercial trucks are sensitive parameters in this analysis and will have a big influence on pavement thickness. The cumulative effect of traffic may be expressed as Equivalent Single Axle Loads (ESALs) for the purpose of pavement design.
- 6 THE GREEN SCENE**
Asphalt is the most recycled product in America and experts recognize that mixtures using reclaimed asphalt pavement (RAP) result in quality pavements. Recycling and reusing materials saves landfill space and is environmentally responsible. Some asphalt producers also recycle asphalt roofing shingles (RAS), use warm-mix asphalt to conserve fuel and improve compaction, and producing porous asphalt mixtures that are used in porous pavements for stormwater management. On building projects with requirements for LEED, these green materials and practices may assist designers and owners in achieving certification.
- 7 PAVE AND SAVE**
With proper base preparation and DGA placement, the asphalt mixture can be evenly placed and well compacted for optimal performance. Quality paving contractors are capable of building parking lots to meet compressed building schedules to better serve their customers. Asphalt pavements remain the most versatile and economic pavement product and have decades of proven performance.

LEARN MORE AT WWW.DRIVEASPHALT.ORG

The APA is a partnership of the Asphalt Institute, National Asphalt Pavement Association and the State Asphalt Pavement Associations.


APA ASPHALT PAVEMENT ALLIANCE

Asphalt.


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Which of the 7 Keys are most important to you?

- Pick your Mix (type selection)
 - Dig Deep (subbase)
 - Drain the Rain (drainage)
 - Build a Base (aggregate foundation)
 - Trucking Along (thickness design)
 - The Green Scene (LEED, EPDs)
 - Pave and Save (construction & inspection)
- 

For which of the 7 Keys could you use the most education?

- Pick your Mix (type selection)
 - Dig Deep (subbase)
 - Drain the Rain (drainage)
 - Build a Base (aggregate foundation)
 - Trucking Along (thickness design)
 - The Green Scene (LEED, EPDs)
 - Pave and Save (construction & inspection)
- 

Resources

New Jersey Asphalt Pavement
Association

www.njapa.com

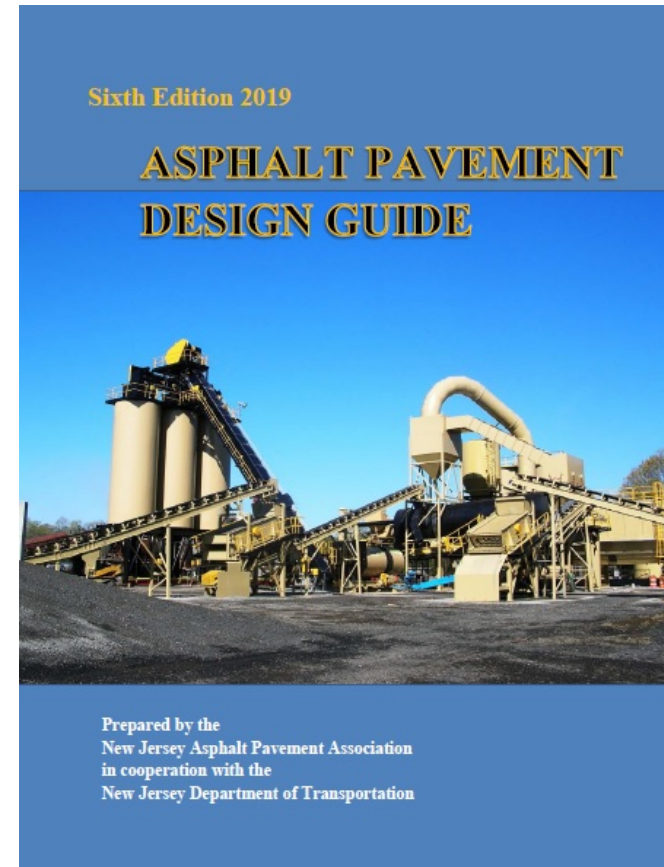
*Asphalt Pavement Design Guide,
6th Edition*

National Asphalt Pavement
Association

www.asphaltpavement.org

Asphalt Institute

www.asphaltroads.org



Travel Safe

- ▶ Thank You!



