Stone Matrix Asphalt, Porous Open-Graded Friction Course, Friction Matrix Asphalt Porous Pavement Pavement

NAPA

NATIONAL ASPHALT PAVEMENT ASSOCIATION

Stone Matrix Asphalt (SMA)

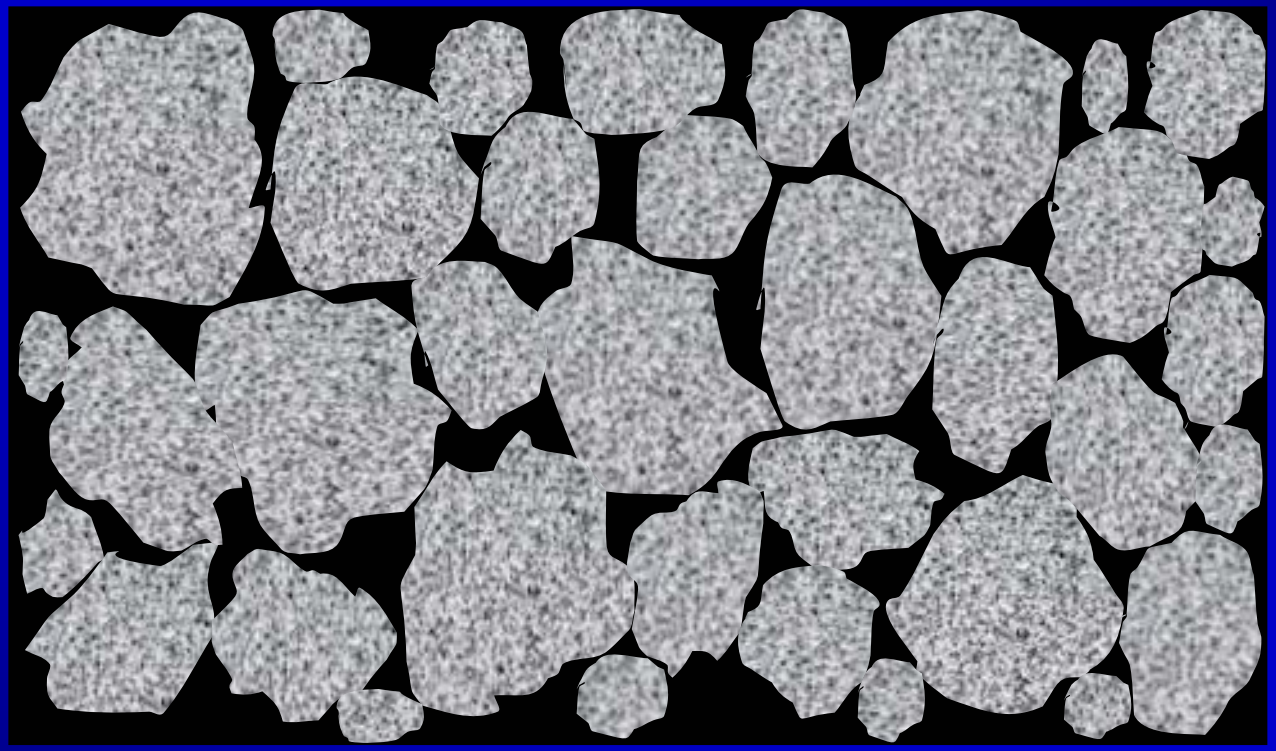
- Premium Surface Mix
- Stone-on-Stone Contact
- Voids Filled
  - Asphalt
  - Filler
- Long Lasting
  - Minimize Rutting
  - Minimize Cracking

Components of SMA

- Aggregate
- Asphalt Cement
- Polymer Modifier
- Mineral Filler
- Fiber Stabilizer
- Hydrated Lime (as needed)

Aggregate Skeleton

Stone Matrix Asphalt Mix




1XC
2XC
5.75

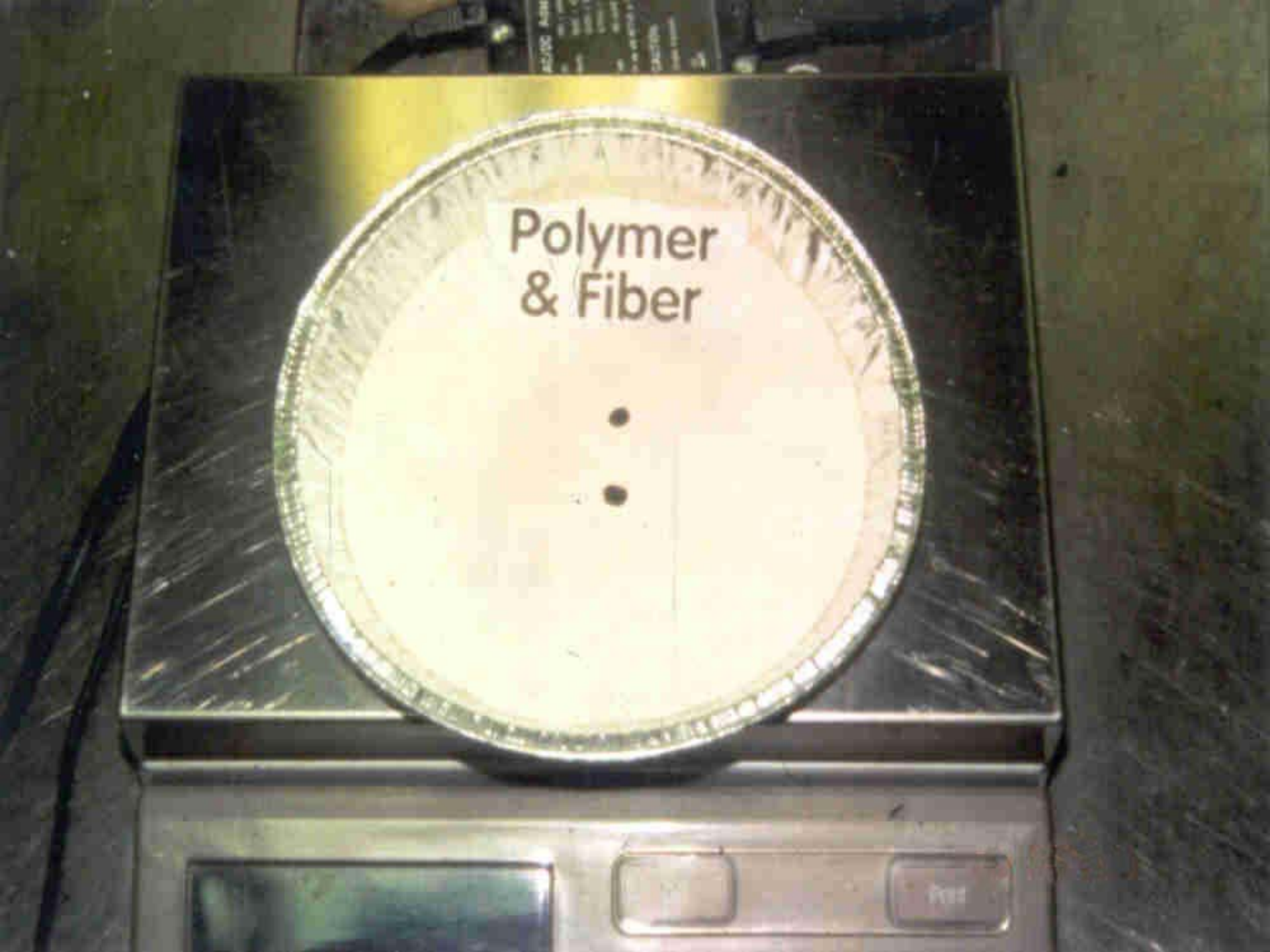

No more than 20% 3:1
No more than 10% 5:1

Asphalt Matrix

- Asphalt Cement
- Polymer
- Fiber
- Mineral Filler

Increased Film Thickness

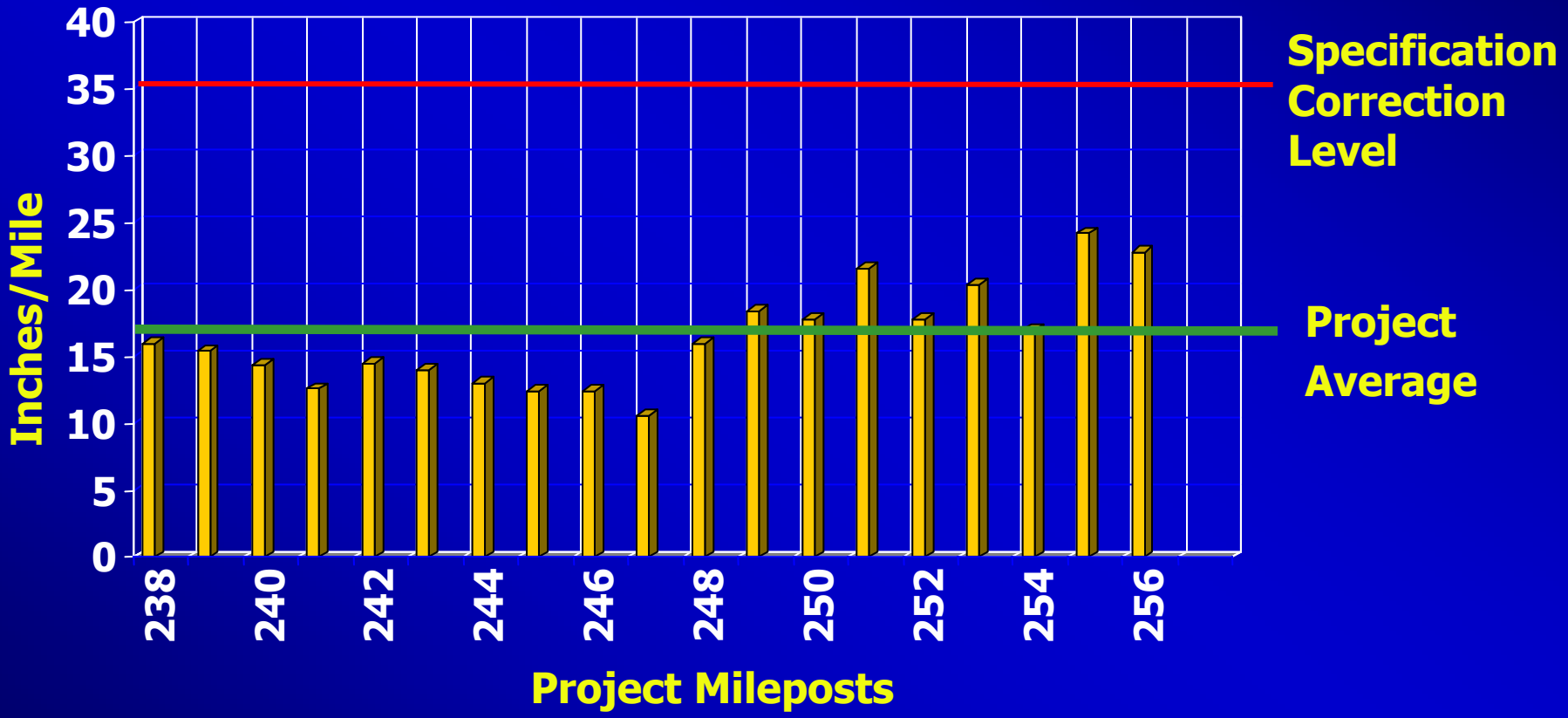
SMA has 25% thicker film coating than conventional dense graded mix.


Polymer
& Fiber

HOV Construction in Atlanta

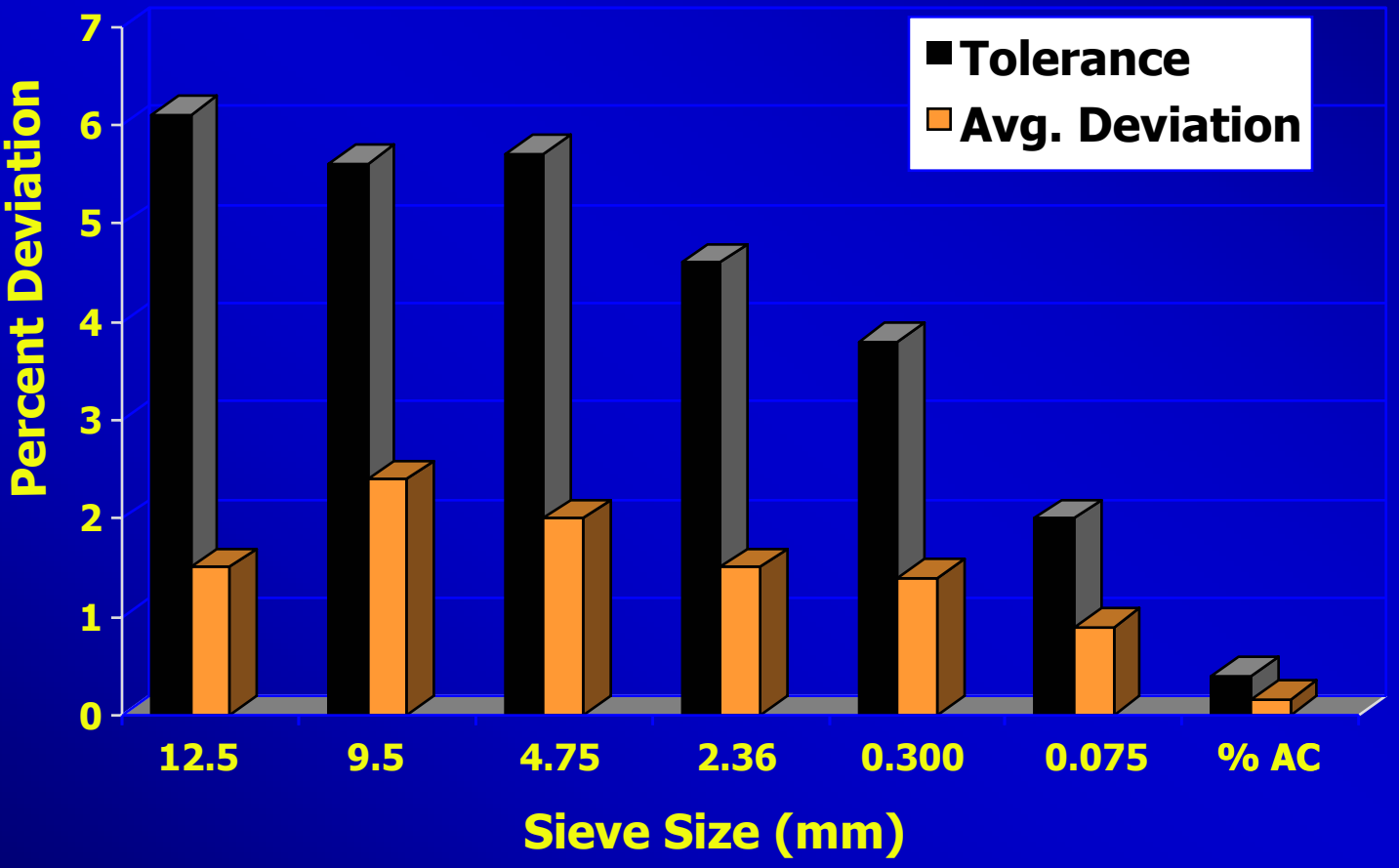
- 330 Lane Miles
- $41 Million Project
- 200,000 Tons SMA
- 20% Increased Traffic Capacity
- Improved Air Quality

Smoothness of SMA Southbound Lanes




ROADTEC

SMA Test Results

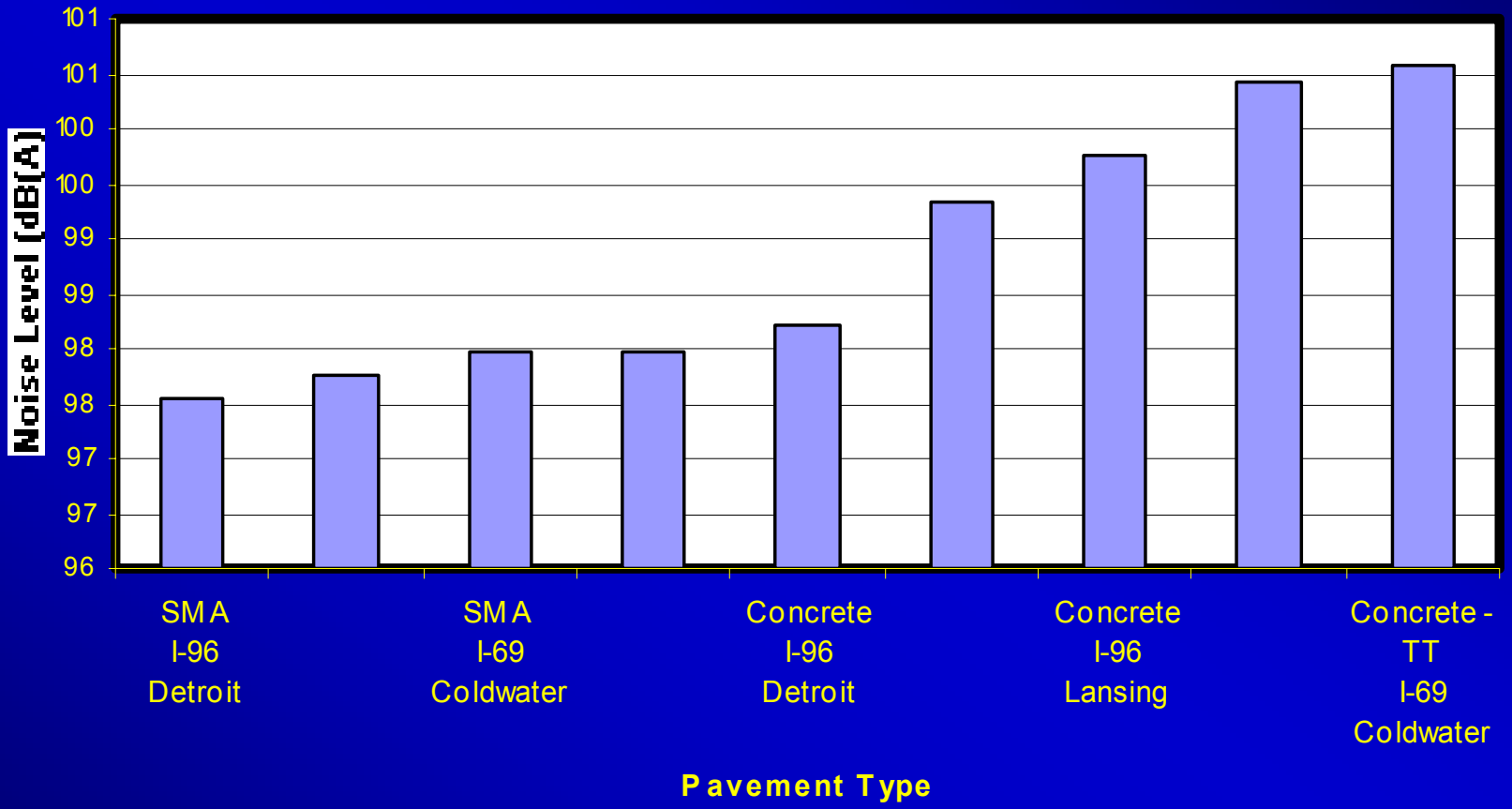


SMA Annualized Costs are 37% lower than Conventional Mix

Stone Matrix Asphalt
Intrinsic Benefits

- 30-40% less rutting than conventional mixes
- 3-5 times greater fatigue life
- Europeans experience 30-40% longer service life
- Lower annualized cost

Michigan Noise Study

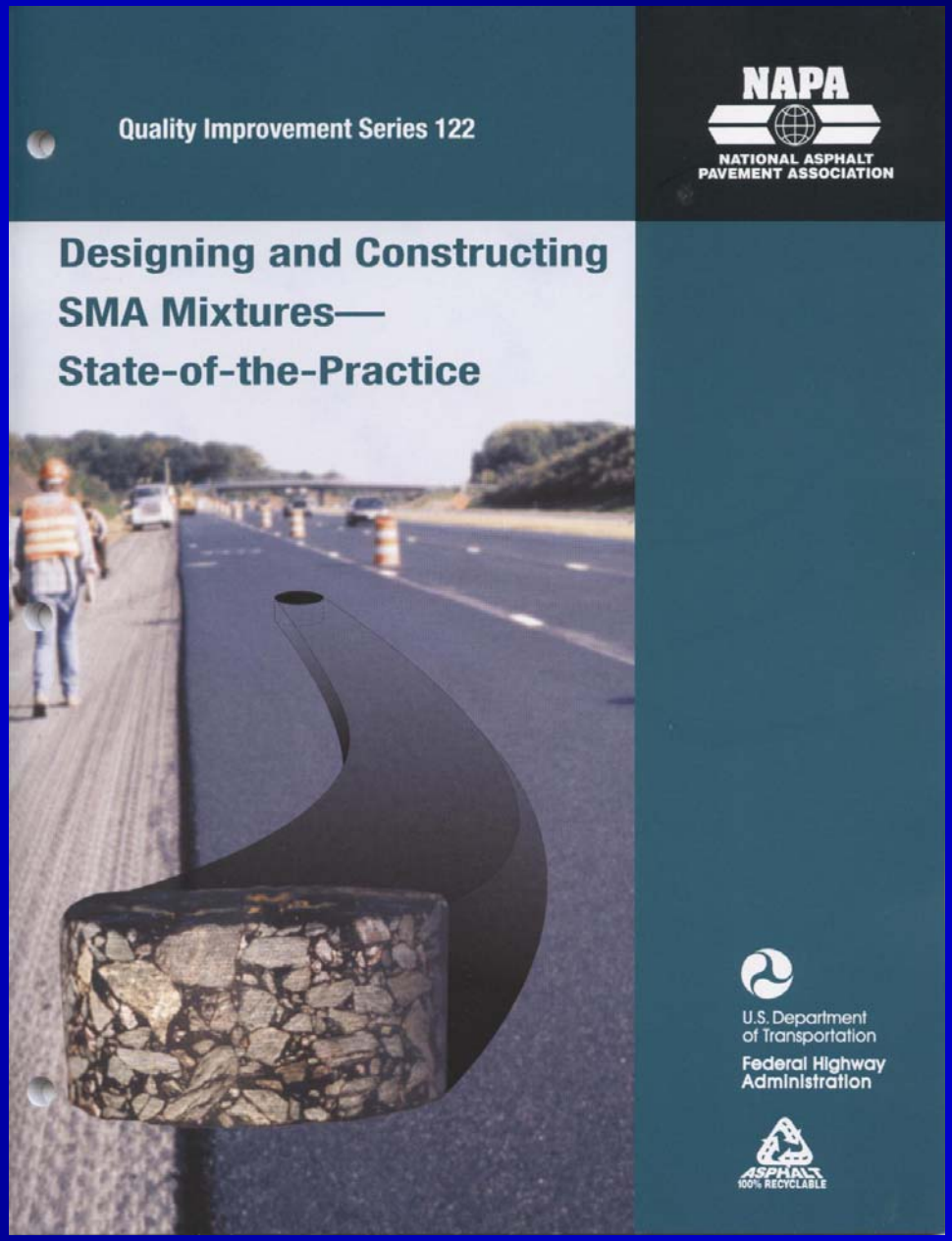


Range is 98 to 101 {3 dB(A)}

Some States Using SMA

- Georgia
- Maryland
- Illinois
- Indiana
- Louisiana
- Michigan
- Wisconsin
- Colorado
- Virginia

Reference:


Quality Improvement Series 122
NAPA
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Designing and Constructing SMA Mixtures—State-of-the-Practice
U.S. Department of Transportation
Federal Highway Administration
ASPHALT
100% RECYCLABLE

Open-Graded Friction Course (OGFC)

What we want:

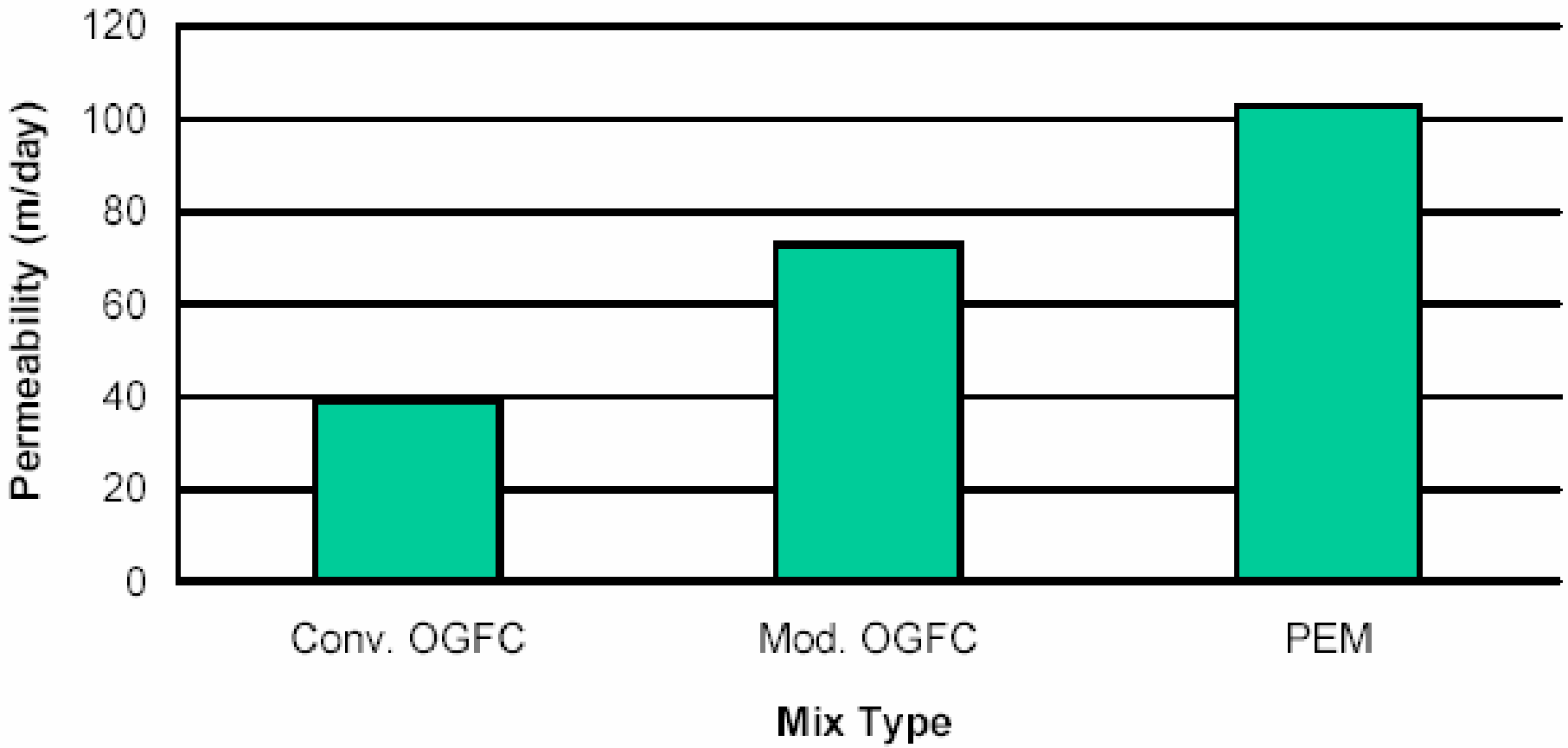
Materials

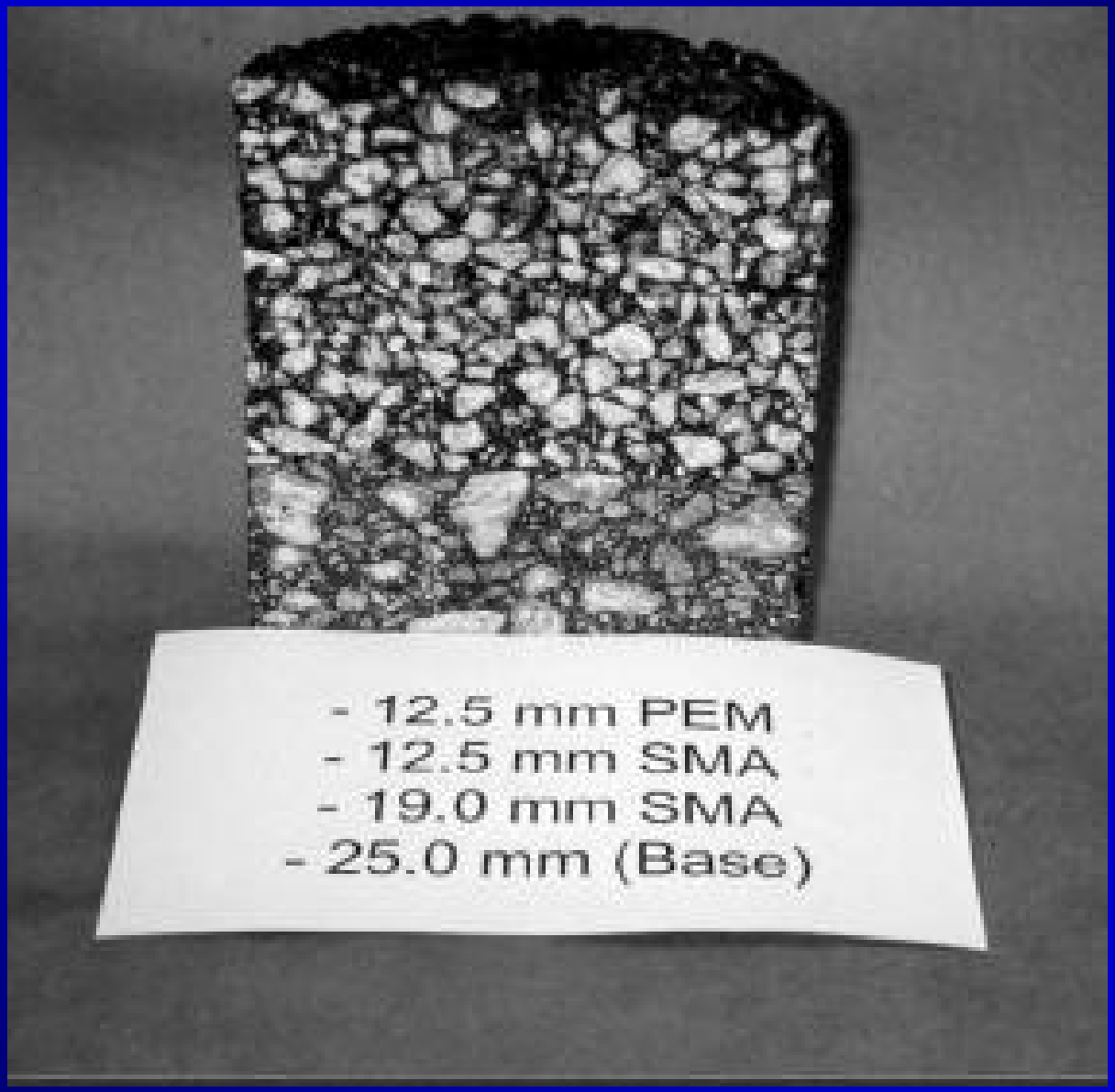
- Hot Mix Asphalt
  - Open Graded Aggregate
  - Crushed Faces
    - 100% 1-face
    - >90% 2-faces
  - Modified Binder - Recommended
  - Fibers - Recommended
  - Void Content > 18%

3/4”	100%
1/2”	85 to 100%
3/8”	35 to 60%
No. 4	10 to 25%
No. 8	5 to 10%
No. 200	2 to 4%

Georgia OGFC

- All Interstates and State Routes with ADT > 25,000
- 850,000 tons since 1993
- Characteristics
  - Gap-grading
  - Fibers
  - Polymer Modified AC
  - 20 - 24% Air Voids


120
100
80
60
40
20
0
Permeability (m/day)
Conv. OGFC
Mod. OGFC
PEM
Mix Type


- 12.5 mm PEM
- 12.5 mm SMA
- 19.0 mm SMA
- 25.0 mm (Base)

- Coarse Superpave Mix
- Stone Matrix Asphalt Mix
- Open Graded Friction Course

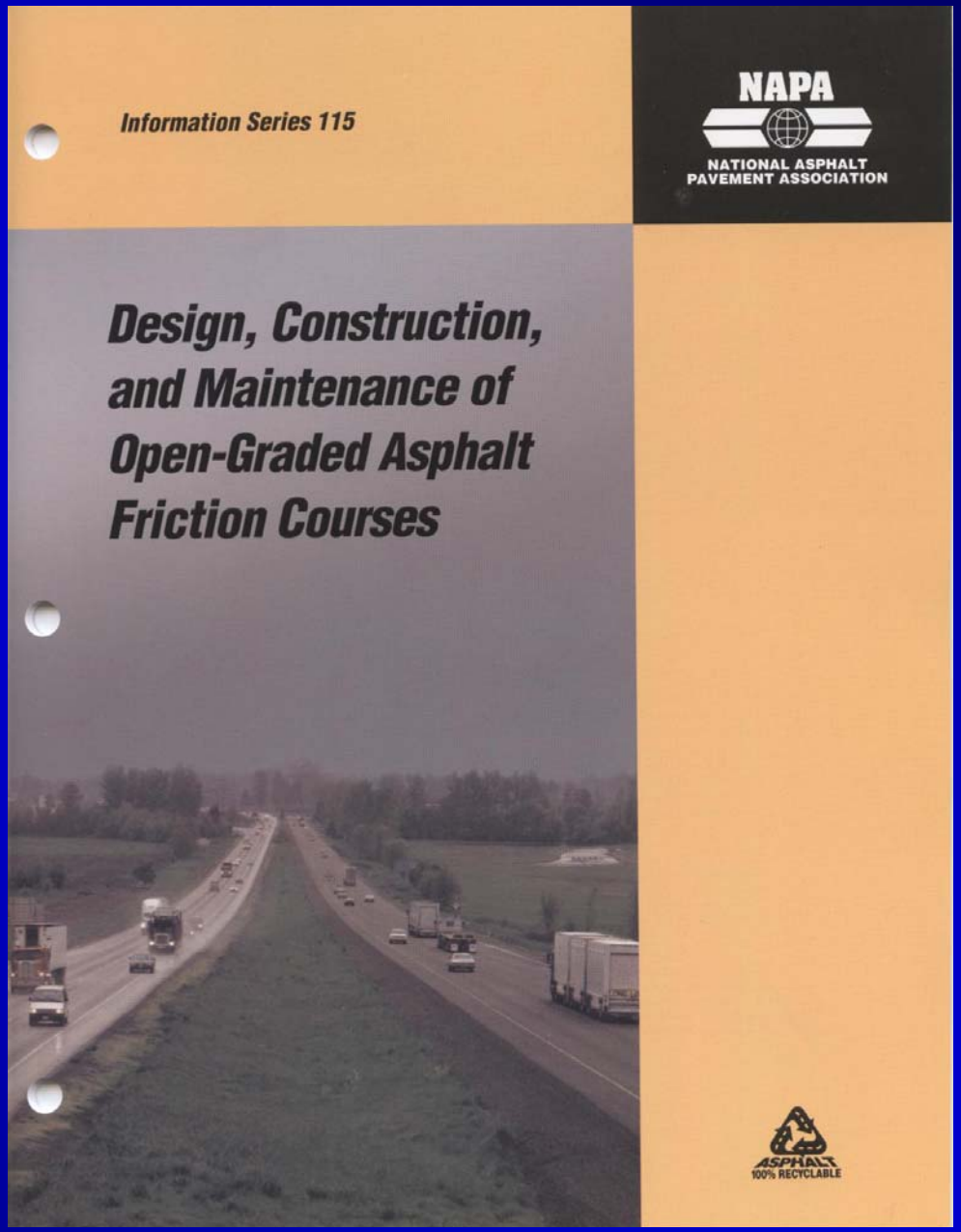
Noise Levels By Surface Type

104.9	Random Transverse (Wisconsin)
102.5	Uniform Transverse (ADOT-3/4”)
99.1	Longitudinal (ADOT-3/4”)
95.5	Whisper Grind
91.8	ARFC (OGFC with Asphalt-Rubber Binder)

Some States Using OGFC

- Georgia
- Florida
- Alabama
- Texas
- Arizona
- California
- New Jersey
- Rhode Island
- Massachusetts
- Oregon

Reference:


Information Series 115
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NATIONAL ASPHALT PAVEMENT ASSOCIATION
Design, Construction, and Maintenance of Open-Graded Asphalt Friction Courses
ASPHALT
100% RECYCLABLE

Porous Pavement

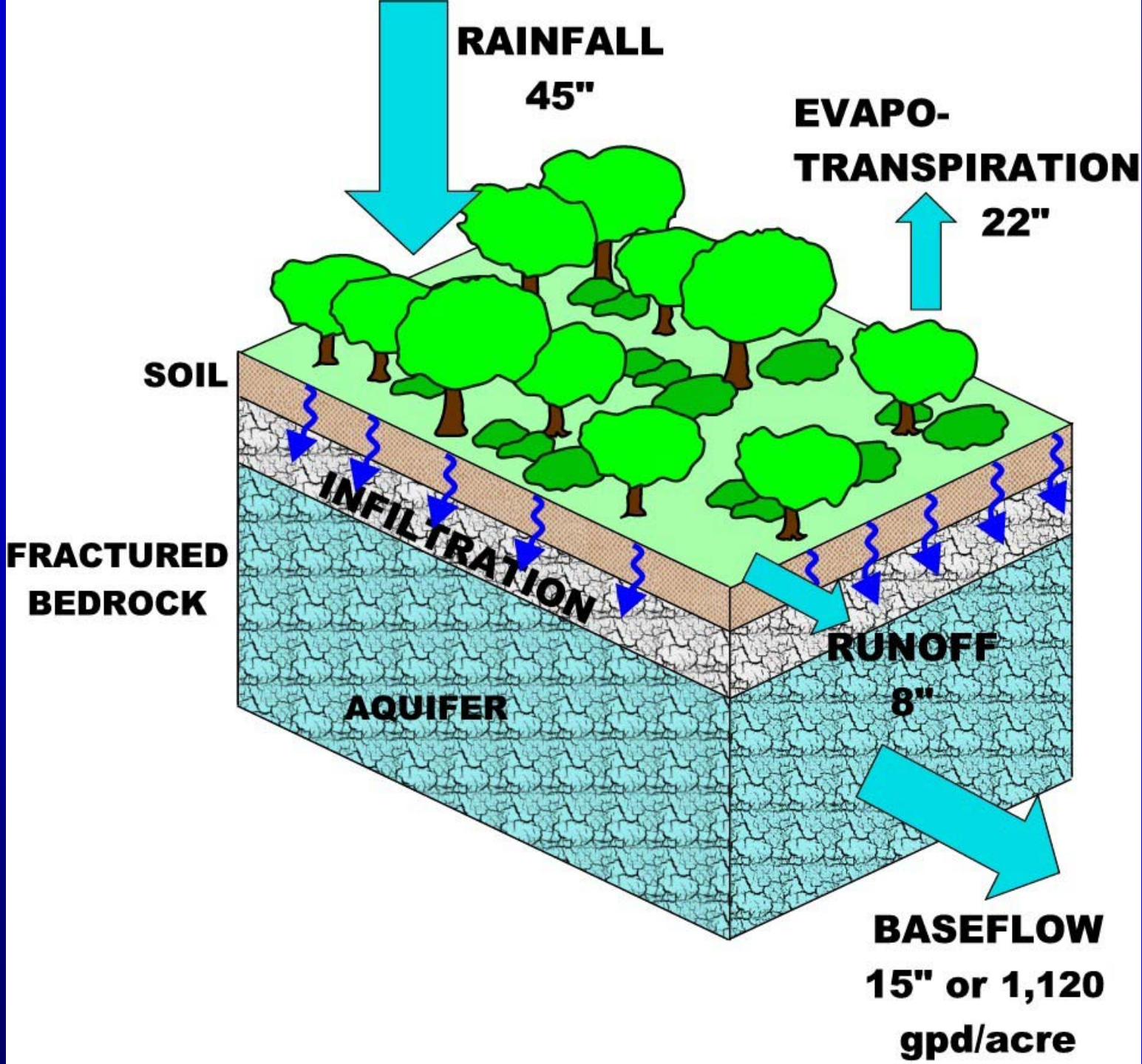
- Porous Surface
- Porous Base
- Allow Infiltration
- Reduce Drainage Features
- Save Land and Trees

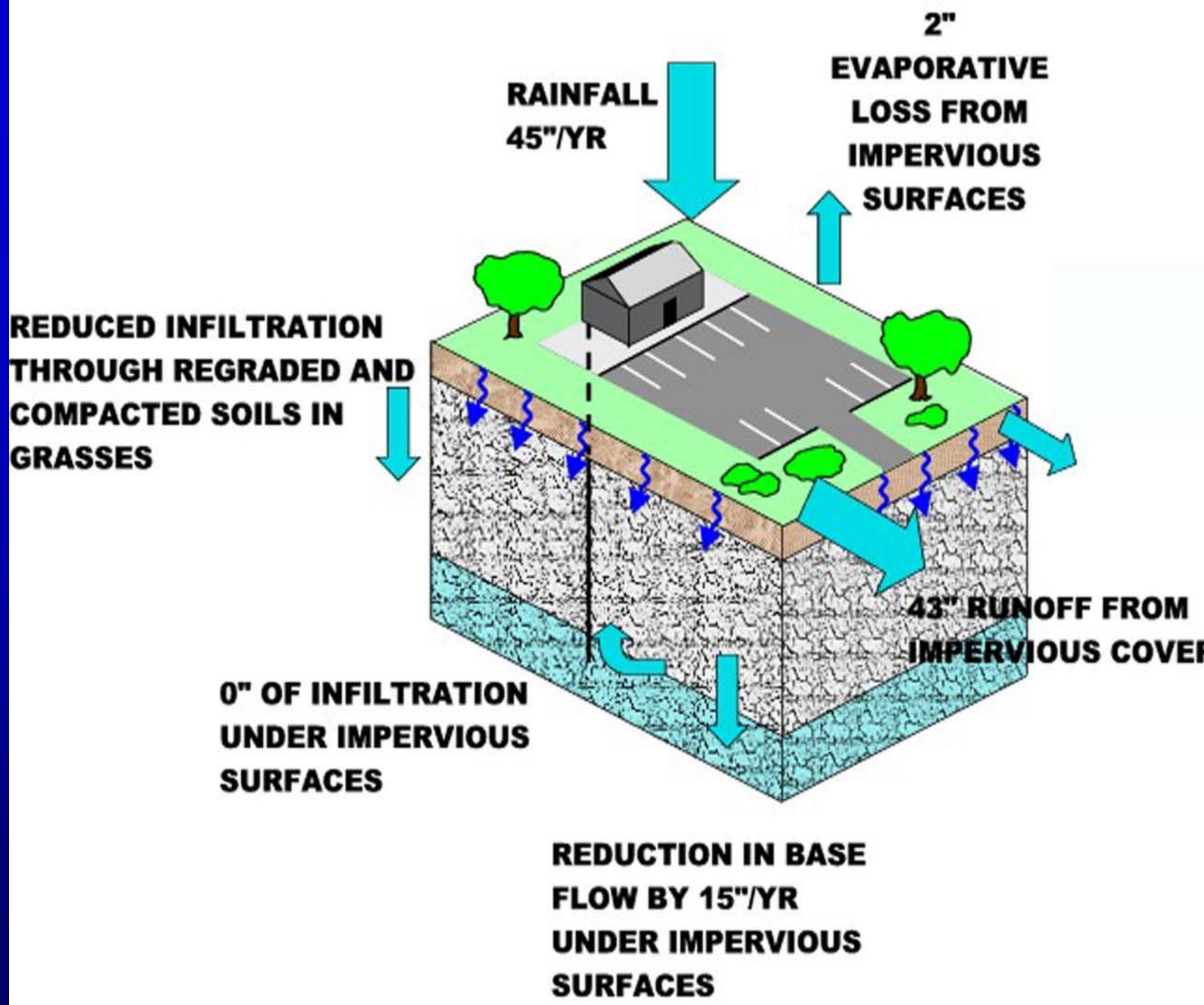
What We Usually Do.

Storm Sewer Inlet

Drainage Field

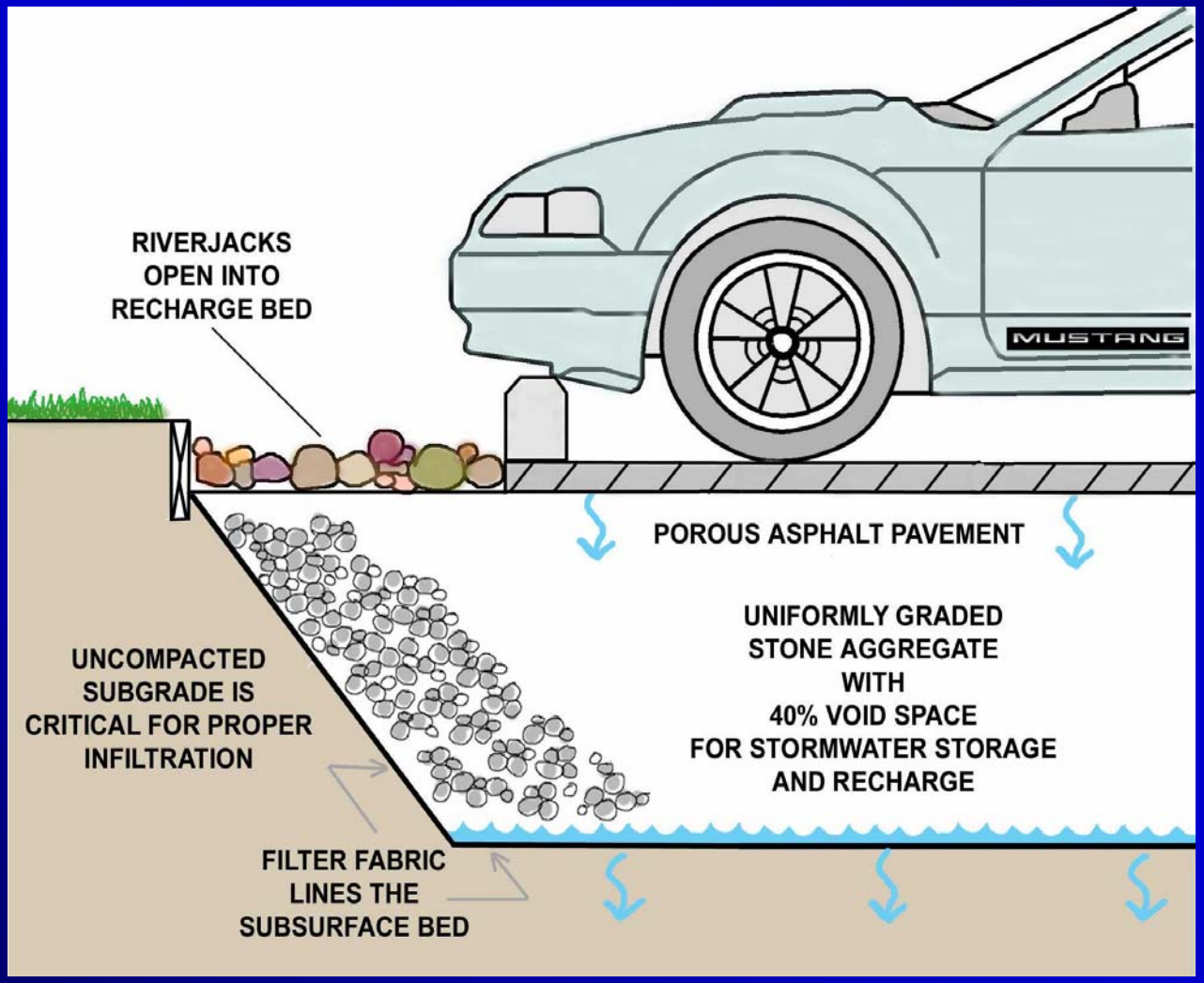
What We Usually Do.


RAINFALL
45"
EVAPO-
TRANSPIRATION
22"
SOIL
FRACTURED
BEDROCK
INFILTRATION
RUNOFF
8"
AQUIFER
BASEFLOW
15" or 1,120
gpd/acre


2"
EVAPORATIVE
LOSS FROM
IMPERVIOUS
SURFACES
RAINFALL
45"/YR
REDUCED INFILTRATION
THROUGH REGRADED AND
COMPACTED SOILS IN
GRASSES
43" RUNOFF FROM
IMPERVIOUS COVE
0" OF INFILTRATION
UNDER IMPERVIOUS
SURFACES
REDUCTION IN BASE
FLOW BY 15"/YR
UNDER IMPERVIOUS
SURFACES

Advantages

- Reduced surface runoff
- Better erosion control
- Better water quality
- Reduced storm sewer requirements
- Maintain natural drainage paths
- Reduced standing water nuisance
- Better GWT recharge
- Better skid resistance


RIVERJACKS
OPEN INTO
RECHARGE BED
MUSTANG
POROUS ASPHALT PAVEMENT
UNIFORMLY GRADED
STONE AGGREGATE
WITH
40% VOID SPACE
FOR STORMWATER STORAGE
AND RECHARGE
UNCOMPACTED
SUBGRADE IS
CRITICAL FOR PROPER
INFILTRATION
FILTER FABRIC
LINES THE
SUBSURFACE BED

New Penn School
Philadelphia

Walkway -
Swarthmore College

Stormwater

Walden Pond
Concord, MA

- Paved in 1977
- 600,000 visitors per year
- Freezing winter conditions
- Still in use 26 years later

University of North Carolina Chapel Hill Friday Center Park & Ride

- University - City Agreement - No increase in GW pollution
- Design: Cahill Associates and Rose Group
- Construction: Mangum Group
- 800 vehicle lot
- $2500/stall vs $3000/stall conventional
- Grand Conceptor Award - Am. Council of Engrg. Companies of NC

Placement of Fabric

Paving Operation

Drainage Demonstration

Design Considerations

- Soils
  - Full infiltration needs k $\geq$ 0.50 inches/hr
  - Partial infiltration needs k $\geq$ 0.25 inches/hr
- Frost - Consider in reservoir depth
- Blowing dust - avoid
- Erosion from surrounding terrain - avoid

Design Considerations

- Slope ≤ 5%
- Typically use 6-mo/24-hr event
  - More conservative 25-yr/24-hr event
- Layers
  - Porous Asphalt (>18% voids)
  - Top Filter - Crushed Stone
  - Reservoir - 1.5 - 3” Crushed Stone (min 8 - 9”)
  - Bottom Filter - Crushed Stone
  - Fabric

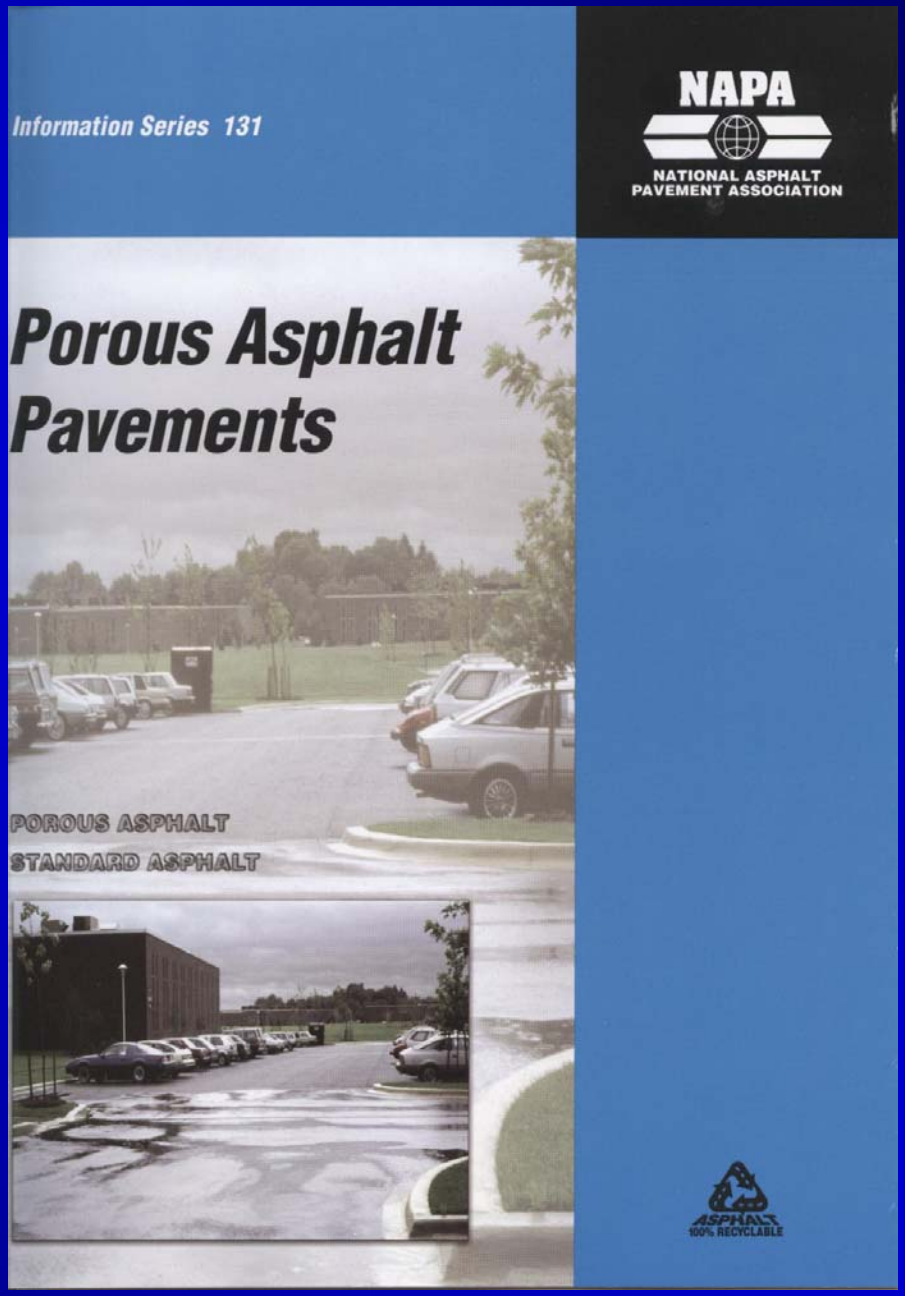
Vehicle Loading

- Best for:
  - Parking lots
  - Recreational areas
  - Sports complexes
- High volume automobile traffic or truck traffic - Consider using Asphalt Treated Permeable Base

Conclusions

- Numerous Advantages to Porous Asphalt Pavements
- Examples of Successful Facilities
- Need Flat Site with Permeable Soils and Low GWT
- Need Low Traffic
- Attention to Detail in Construction
- Maintenance is Important

Reference: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Porous Asphalt Pavements
POROUS ASPHALT
STANDARD ASPHALT
ASPHALT 100% RECYCLABLE