# Porous Asphalt Pavement for Storm Water Management

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NJAPA

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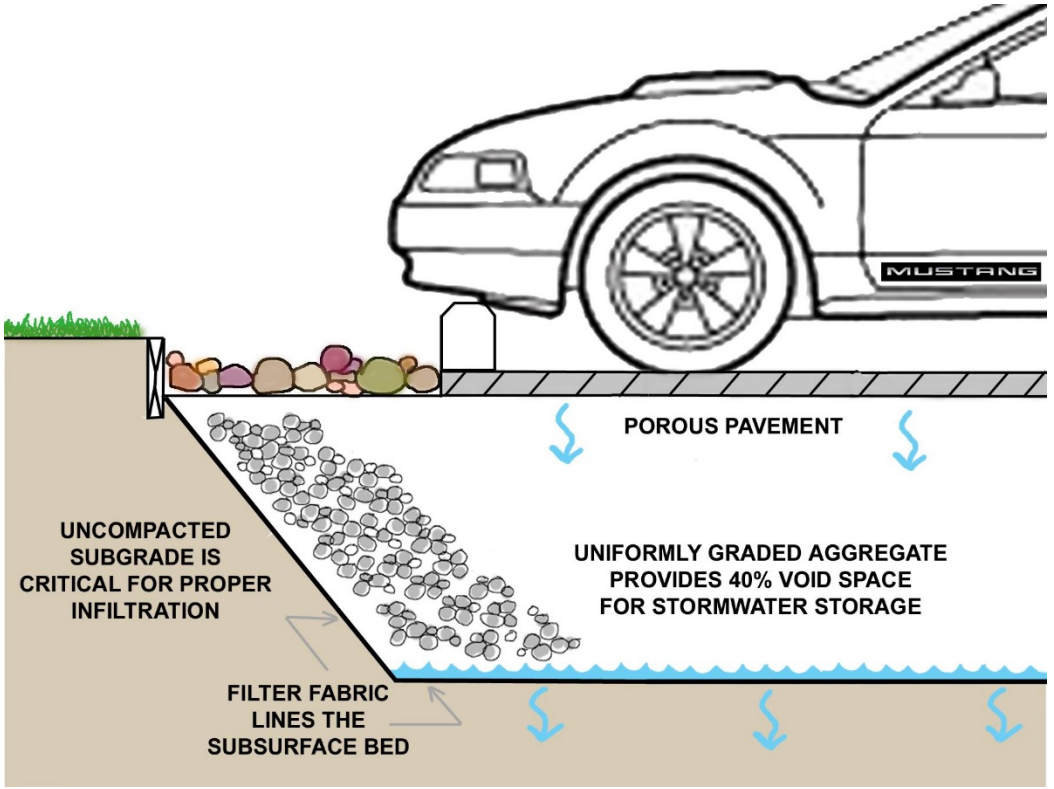
# Why Porous Pavements?

- Reduce impervious surface
- Recharge ground water
- Improve water quality
- Eliminate need for detention basins
- Reduce permitting requirements

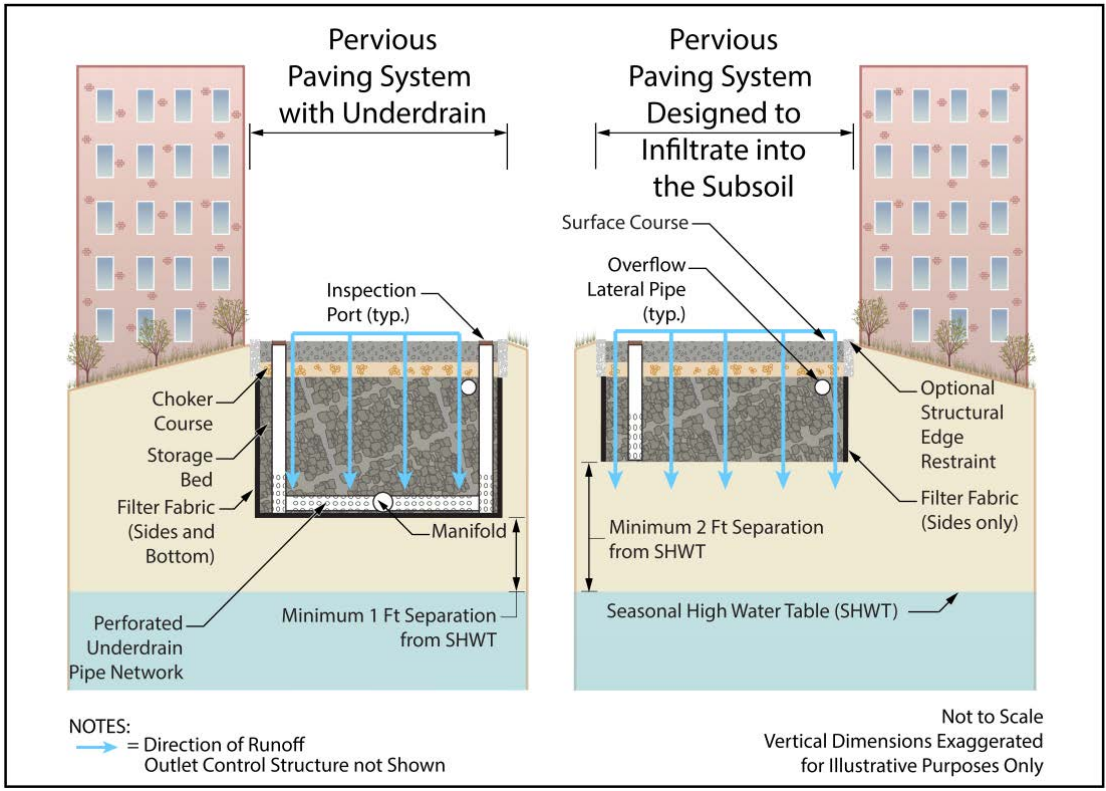


# Why Porous Pavements?

- Reduces hydroplaning
- Reduces glare
- Reduces backspray
- Reduced tire-pavement noise
- Less susceptible to frost
- Reduces use of de-icing chemicals

# Important Considerations

- Subgrade condition
  - Sand?
  - Silt?
  - Clay?
- Seasonal high groundwater table
- Discharge system?
  - Infiltration
  - Mechanical (Underdrain)




*Graphic courtesy of NJDEP*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# Materials

- Geotextile
  - Non-woven AASHTO M288 Class 2 (NJDOT Specification 919.01)
- Stabilization course
  - ½" Stone (AASHTO No. 7- NJDOT Specification 901.03)
- Reservoir bed
  - 2"-3" Stone (AASHTO No. 2 – NJDOT Specification 901.03)
- Choker course
  - 1" Stone (AASHTO No. 57 – NJDOT Specification 901.03)

# Materials

- Asphalt base course
  - Asphalt Stabilized Drainage Course (ASDC) (NJDOT Specification 902.06)
- Asphalt surface course
  - Open Graded Friction Course (OGFC) (NJDOT Specification 902.03)
- Binder
  - 64**E**-22 (polymer modified)

# Materials – Stabilization Course

Engineering judgment is required to determine if a stabilization course is necessary.

A stabilization course should be used if there is a potential for the subgrade to compress or to be subject to lateral movement during construction.

# Materials – Reservoir Bed

Per NJDEP proposed best practices:

- Storage bed aggregate must be **clean**, uniformly-graded broken stone whose size designation is appropriate for the surface course desired and design load conditions. The stone must be washed, prior to placement, to minimize the amount of stone dust and other fine particles that can clog the surface of the subsoil.

# Materials – Choker Course

Per NJDEP proposed best practices:

- The choker course must consist of **clean**, **washed** broken stone whose size designation is appropriate for the surface course desired and design load conditions. The smallest size designation that may be used is AASHTO No. 57.

The choker course will lock in the reservoir bed, providing a smooth surface for paving.

# Materials – Asphalt Binder

Use polymer modified binder 64E-22 in surface course

- Especially critical for parking lots, polymer modified binder will minimize scuffing due to power steering
- Also consider Warm Mix additives – increased film thickness and better workability
- Both add to durability and service life

# Typical Cross Section

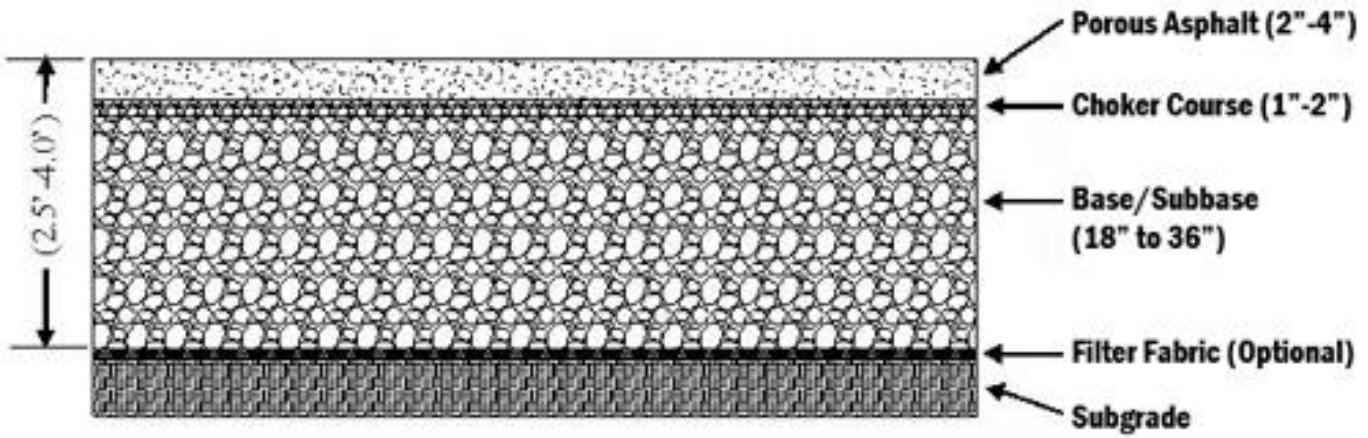


Figure 3. Typical Porous Asphalt Pavement Section *(diagram adapted from US EPA)*


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# Bed Excavation

- Excavate bed to plan elevation using equipment w/ “soft footprint”
- Don’t compact subgrade*

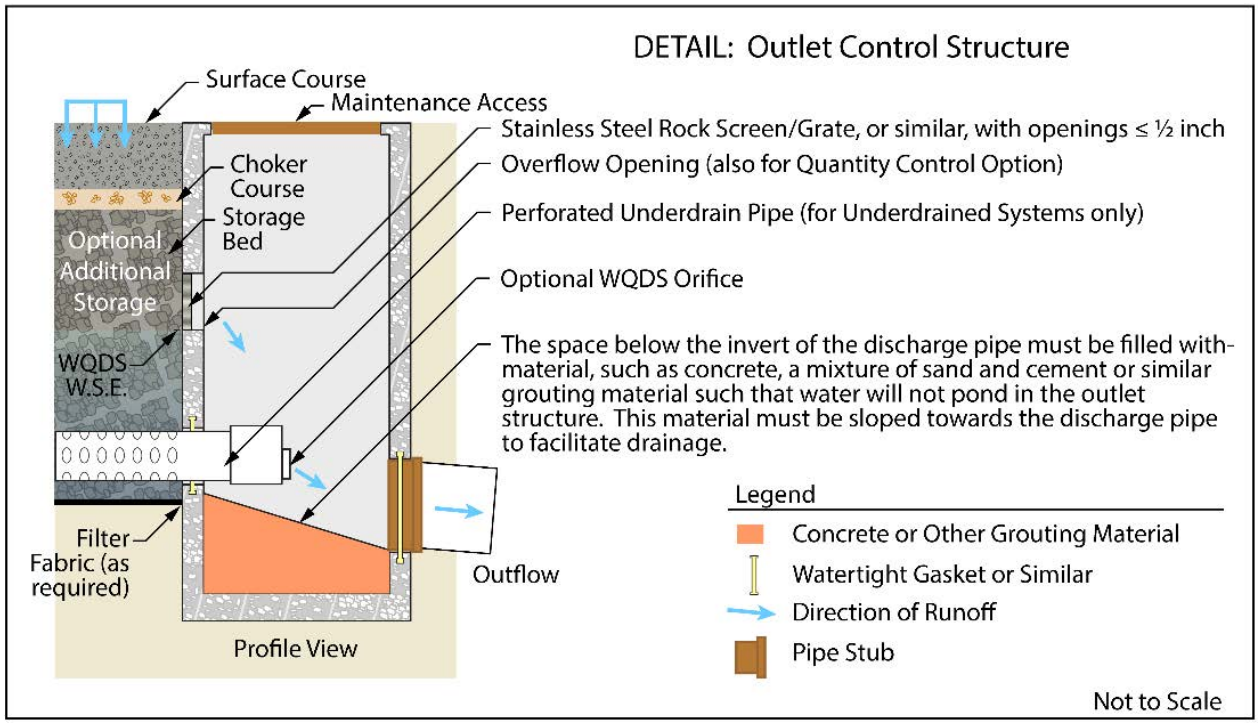


# Non-woven Geotextile

- Spread geotextile immediately after fine grading
- Overlap fabric >16”
- Install drainage pipes if used
- Excess fabric (>4’) folded over agg. later

# Underdrain

- For systems designed for quantity control only, an outlet control structure will be required




*Graphic courtesy of NJDEP*

# Stone Recharge Bed

- Place **clean**, single size, **washed** aggregate.
- Do not drive trucks on fabric
- Spread and grade with tracked equipment in 8” lifts
- Light compaction – static
- Protect pipes

# Choker Course

- Place “Choker” course – ½” clean washed aggregate.
  - Purpose to lock up surface for stable paving platform
  - 1 – 2” thick
  - Grade and compact
    - Static
    - Vibratory? – (maybe – with low amplitude, high frequency)

# Paving

- Paving as usual?
  - Recommend track paver
  - Less rolling required
- Avoid truck movement over aggregate
  - Stability may be an issue
  - Avoid disturbing aggregate surface – but it will happen
- Plan for Production to be less than normal

# Compaction

- Use Static compaction
- Breakdown with a 10 ton steel wheel roller (2 – 4 passes – check with nuclear density gauge)
- Finish with a 3.5-5 ton roller


# Rolling Temperature is Critical

Beware of asphalt surface cooling too quickly

Ambient Temperature 50 to 70°

Wind speed ideally 0 to 3 mph

No paving of Surface Course under 50°

# Rolling Temperature is Critical

Asphalt Base Course – 200-245°

Asphalt Surface Course – 200-220°

Finish Rolling Base Course – 140-150°

Finish Rolling Surface Course – 110-140°

# After Compaction

- Limit traffic for 48 hours to allow to set up
- Keep sediment control in place until vegetation is established

# Inspection and Quality Control

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# Before Construction

- Protect your investment with proper soil erosion and sediment controls
- Grade adjacent areas to be vegetated away from the work, creating swales, if possible

# Before Construction

- Construct a test strip
  - Use to calibrate nuclear density gauge
  - Determine rolling pattern
- Base Course air voids target is 25% or more
- Surface Course air voids target is 15% or more

# During Construction

- Check for density
  - Nuclear gauge

- Base Course air voids target is 25% or more
- Surface Course air voids target is 15% or more

# After Construction

- Check for permeability (NJDEP BMP = 6.4 in/hr for quality, 20.0 in/hr for quantity)
  - Hose test
  - Bucket test
  - ASTM C1701


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# Maintenance Considerations

Proper maintenance is critical to the success of pervious pavement systems.

- DO NOT use a pervious pavement for storage of any materials
- DO Inspect the surface course annually for any distress – repair areas by removal and replacement of the surface course in kind
- DO NOT use sealers or coatings of any kind that will clog the surface

# Maintenance Considerations

- DO Vacuum the surface course at least four times per year (DO NOT power sweep!)



- DO power wash after vacuuming

# Maintenance Considerations

- DO NOT set plow blades to a level that will damage the surface
- DO NOT allow plowed snow to accumulate on the surface (have an area off pavement for snow storage)
- DO NOT use sand, cinders, or any de-icing materials that do not dissolve in solution
- DO maintain adjacent vegetated areas

# Post Construction Review

## Resources & Reference Materials

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# General Observations

- A key to performance: high quality **CLEAN** stone base/reservoir course
- For fine grained soils reservoir course should be a min of 18”
- For thicker, multiple lift asphalt sections, you can eliminate the choker course
- Asphalt Base should be ASDC
- Asphalt Surface should be OGFC with polymer-modified binder (64E-22)

# Common Porous Mix Problems

- Not using polymer-modified binder in surface course
- Compacting outside optimal temperature ranges
- Not properly rolling choker course
- Ignoring compaction – proper compaction will not clog pores if proper gradation used
- Beginning with an uneven subgrade - must be flat and **uncompacted***

# Resources

NJAPA – www.njapa.com

NAPA – www.asphaltpavement.org

NJDEP – www.state.nj.us/dep and the New Jersey Stormwater Best Management Practices Manual – http://www.nj.gov/dep/stormwater/bmp_manual/NJ_SWBMP_9.7.pdf

# Publications

National Asphalt Pavement Association

*PS-33 – Porous Asphalt Pavements*

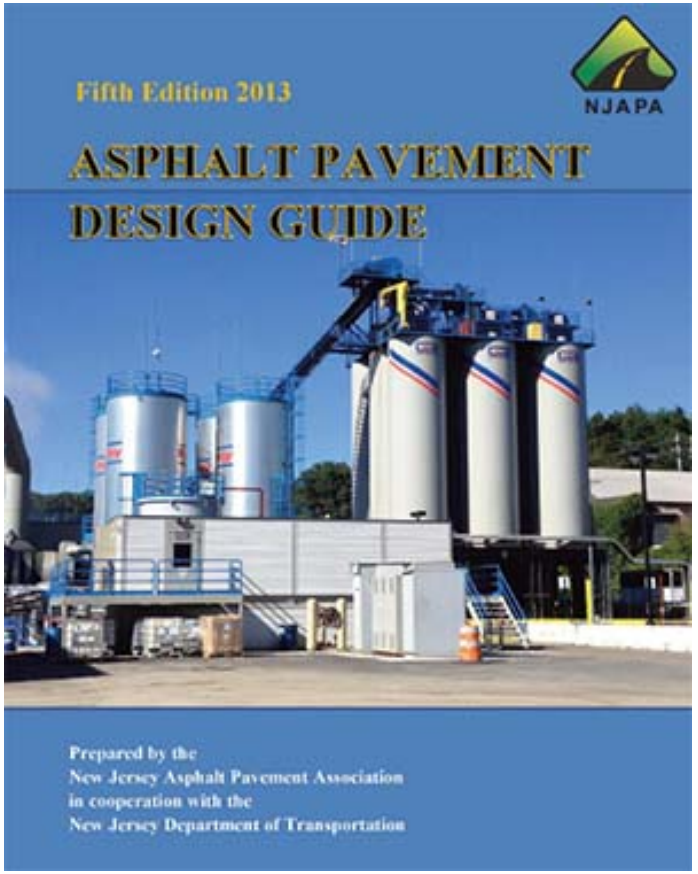
*IS-131 – Porous Asphalt Pavements for Stormwater Management*

*FHWA HIF 15-009 – Porous Asphalt Tech Brief*

# Publications

New Jersey Asphalt Pavement Association

*Asphalt Pavement Design Guide*



# Publications

Asphalt Institute

*MS-2 – Mix Design Methods*

*SP-2 – Superpave Mix Design*

*MS-4 – The Asphalt Handbook*

*MS-22 – HMA Construction*

*MS-26 – Asphalt Binder Handbook*

# Acknowledgements

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# Project Closeout

## Any Questions?

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