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Speaker

Not All Pavements are Equal for Winter Maintenance

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Salt Symposium

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- For the purpose of this presentation when the term deicing is used it refers to all methods of application and products unless specified.
- Pavement Types Discussed
  - PFSs – Permeable Friction Surfaces
    - Wearing course friction layers (ex. open graded, ultrathin, and permeable friction courses)
  - PAPs – Porous Asphalt Pavements
  - DGFs – Dense Grade Friction Surfaces
    - Traditional asphalt and concrete

Structural profile of various permeable pavements (Zhang and Kevern, 2021)

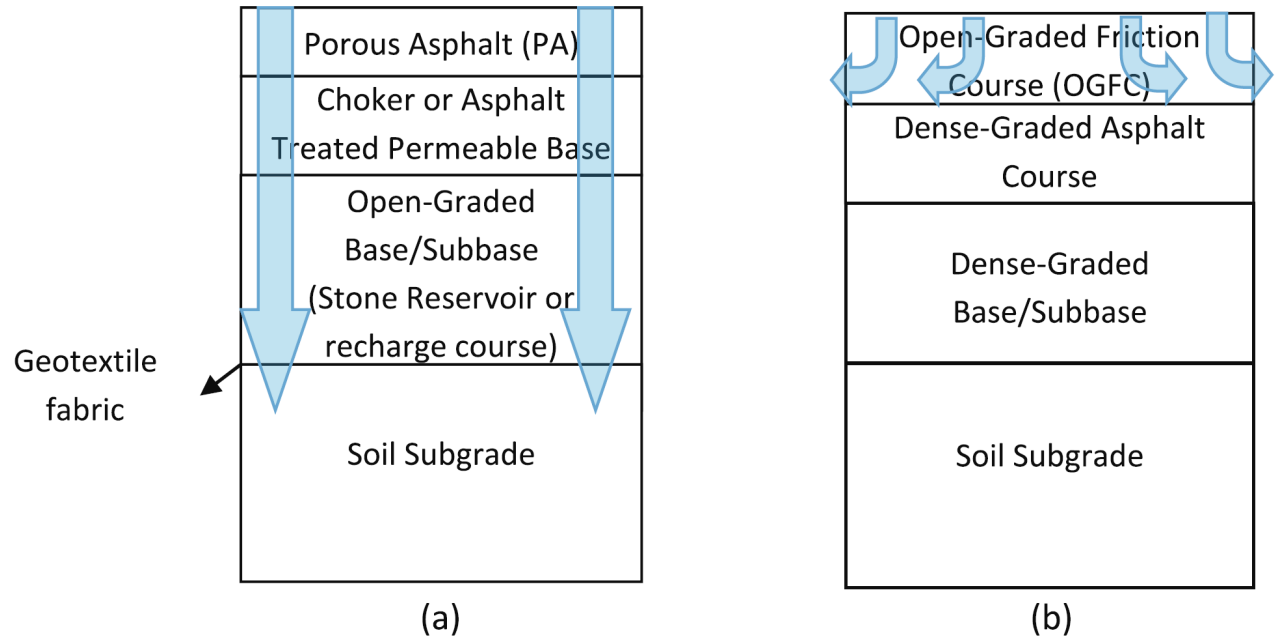


Fig. 1 Typical structures and water flow paths of (**a**) porous asphalt pavement and (**b**) pavement with open-graded friction course. (Layer thicknesses are not scaled)

What the literature tells us…

- The purpose of PFSs is to drain water off the roadway surface.
- Rain on PFSs that are not frozen will drain water from the road surface and prevent ice formation.
- High textured PFSs can break up thin ice layers when trafficked
- A driver may not notice the difference between PFSs and DGFs under heavy traffic

Research Conclusions

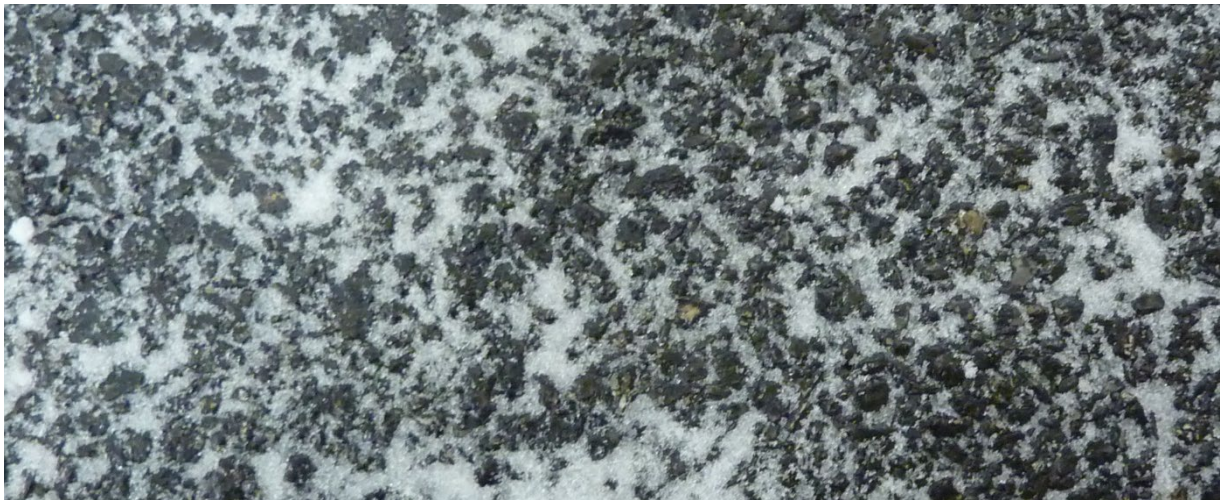
- Traffic
  - Brings moisture back to the road surface caused by “air pumping” from vehicle tires
  - Causes PFSs to dry slower
  - Deicers applied that appear lost in PFSs voids, can be “pumped” back to the road surface by heavy traffic.
  - Road managers can encourage this by redirecting traffic to one lane or reducing vehicle speed.

Research Conclusions

- Compacted snow bonds more strongly to PFSs, yet FRICTION was significantly GREATER than traditional DGPs after snow removal. Even with the use of salt (deicers).
- This is due greater frictional properties of open graded, ultrathin, and permeable friction courses.

Research Conclusions

- PFSs appeared more white and snowier than DGPs.



Research Conclusions

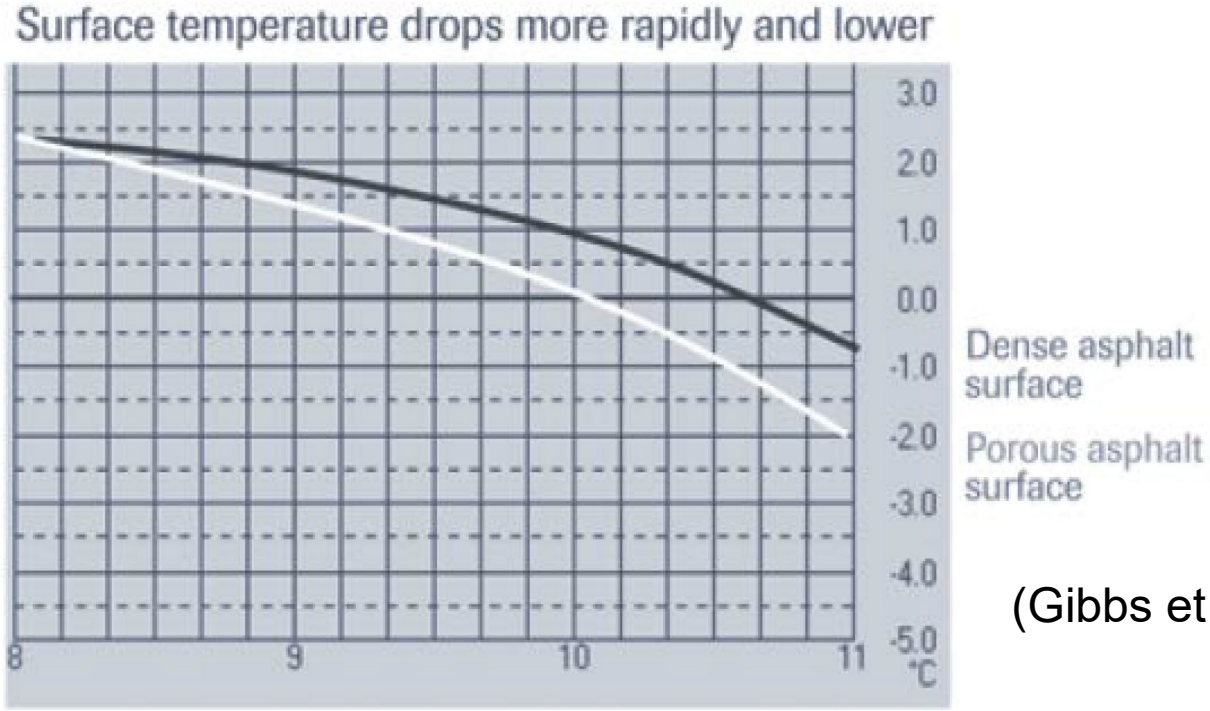
- Visual or optical road surface state assessment of PFSs may provide misleadingly low pavement state or friction values.
- This may contribute to unnecessarily high application rates of deicers.

Plowing Recommendations

- PFSs can be more easily damaged by plowing than DGPs.
  - Compacted snow bonds more strongly to PFSs
- Shoes should be used to keep the plow blades just above the pavement surface.
- Rubber-edged plow blades can be used.

Recommendations

- Icing and frost formation occur more often on PFSs than DGPs during cold clear night when located close near bodies of surface water.



(Gibbs et al., 2005)

Treatment Recommendations

- Sand and abrasives are not recommended for use on PFSs.
- To avoid losing deicing material in the pavement matrix:
  - Liquid deicer application on PFSs should use flood or fan nozzles instead of stream nozzles.
  - Solid deicers application on PFSs should use larger grain material

Treatment Recommendations

- Anti-icing before the storm is recommended if pavement temperature are above 20°F and snow is NOT blowing/drifting.
- Application rates
  - NaCl: 20-40 gal/l-m

Treatment Recommendations

- Deicing can be used during and after a storm.
- Until additional field testing occurs, deicer application should be 25% to 50% greater than DGPs application rates.
- PAPs allow lower salts application due to the rapid responses to ambient temperatures and prompt drainage of meltwater (Zhang and Kevern, 2021)

Maintenance Recommendations

- Regular maintenance can only restore the permeability of PAPs partially but are critical to maintain longer performance
  - Mechanical sweeping
  - pressure washing
  - vacuum sweeping
- Shallow surface milling

(Zhang and Kevern, 2021)

Resources

- Friction and Snow-Pavement Bond after Salting and Plowing Permeable Friction Surfaces https://journals.sagepub.com/doi/10.1177/0361198120949250
- Snow and Ice Control on Porous and Permeable Pavements – literature review and state of the practice https://trid.trb.org/view/1288499

Thank you

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Design considerations

- High frost-susceptible soils PAP thickness should be down to the frost penetration depth.
- Polymer modified asphalt binder with higher binder content (or anti-stripping additives) can improve freeze thaw durability and reduce raveling.