

Testimony for the Record
Submitted to the Committee on Transportation Finance and Policy
Hearing on HF 185, “Resilient Pavement Program”
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Chairman Koznick, Ranking Member Koegel, and Members of the Committee:

Thank you for inviting me to participate in today’s hearing and thank you for your attention to a topic that has been the focus of my professional career, and which is of critical national importance.

Introduction and Background

My name is David White, and I am the founder and CEO of Ingios Geotechnics, a leader in advancing pavement foundation design, construction quality monitoring, and verification solutions. I have dedicated my career to ensuring that our nation’s transportation infrastructure is built on sound engineering principles, supported by real-time data and verification processes that lead to long-lasting, high-performing roadways. I have performed research funded by FHWA, state DOTs, and industry, allowing me to assess pavement foundations in twenty-five states and three countries. Prior to founding Ingios, I served as a professor of civil engineering at Iowa State University, leading a national pooled fund study to assess the engineering of pavement foundations and identify the importance and challenges for improving national specifications and construction quality verification technology <https://publications.iowa.gov/35176/>.

Ingios Geotechnics is at the forefront of innovation in pavement foundation technology, working with state departments of transportation (DOTs) across the country. We specialize in assisting state DOTs in improving foundation layers to enhance pavement durability, reducing costs and minimizing maintenance needs. In response to the need to accelerate the implementation of improved pavement foundations, the FHWA provided an AID grant to implement improved pavement foundation practices in Iowa (<https://publications.iowa.gov/39532/>), leading to significant improvement in pavement foundation quality and pavement longevity (<https://publications.iowa.gov/42253/>). Ingios has conducted pavement foundation assessments at nationally recognized MnROAD facilities in 2017, 2022, and 2024, as well as on the I-494 reconstruction project in 2023 and several other demonstration projects in Minnesota.

Why This Issue Matters

Inadequate pavement foundation practices threaten the integrity of our nation's transportation infrastructure. Pavement foundations are the unsung heroes of our roadways—when properly designed and verified, they can extend pavement life by 20-50%, reducing taxpayer burdens and minimizing costly road repairs.

A recent national survey of state DOTs found that:

- Ninety-seven percent of agencies want more effective quality acceptance (QA) for pavement foundation construction.
- Ninety-four percent want to field-verify engineering properties used in pavement design.
- Ninety-seven percent seek real-time QA data to ensure compliance with design and specification requirements.

This issue affects engineers, contractors, and every American who depends on safe, durable, and cost-effective roads.

According to the FHWA Accelerated Implementation and Deployment OF Pavement Technologies (AID-PT) program:

“Improving pavement foundation design is a focus area for FHWA. A pavement foundation that does not degrade over time does not need to be replaced, which may translate to significant sustainability benefits in environmental impact and costs. In congested areas, eliminating the need to replace the foundation could be highly advantageous by expediting pavement rehabilitation. <https://www.fhwa.dot.gov/pavement/pubs/hif21024.pdf>

“We are constantly looking for ways to make pavements perform better and last longer. We have already improved the materials, specifications, and construction practices we use, and evaluating foundations is another way we can extend the life of the state's pavements.”

— CHRIS BRAKKE, Iowa DOT Pavement Design & Pavement Management Engineer

The Real Cost of Poor Foundations

To illustrate, consider the real-world case in Iowa, where foundation verification mapping revealed that 70% of tested pavement foundations failed to meet design specifications (<https://publications.iowa.gov/30754/>). Without intervention, this could have led to premature pavement failure, costing millions in repairs within just a few years. By implementing real-time verification technologies, Iowa DOT was able to ensure that their road investments would last significantly longer, saving taxpayers money and reducing disruptions for motorists.

The Limitation of Pavement Thickness in Ensuring Longevity

Increasing pavement thickness alone does not guarantee better pavement life if built upon poor pavement foundations. The structural integrity and long-term performance of pavements rely heavily on the quality of the foundation layers. Without a stable, well-engineered foundation, even the thickest pavements can suffer from premature failures such as cracking, rutting, and uneven settlement.

Key reasons why thickness alone is insufficient include:

1. **Non-Uniform Settlement:** Weak or variable subgrade conditions lead to differential settlement, causing stress concentrations and early cracking regardless of pavement thickness.
2. **Moisture Susceptibility:** Poor drainage and moisture retention in weak foundations result in water infiltration, reducing material strength and accelerating pavement deterioration.
3. **Lack of Load Distribution Support:** A strong foundation distributes loads effectively. If the foundation is weak, heavier pavement layers only delay but do not prevent structural failures.
4. **Increased Maintenance Costs:** Pavements built on poor foundations require frequent repairs and resurfacing, negating the benefits of additional thickness and increasing long-term costs.
5. **Environmental and Economic Impact:** Over-reliance on thicker pavements wastes materials, increases construction costs, and does not address the root cause of failures.

To achieve long-lasting and resilient pavement systems, it is essential to prioritize engineered pavement foundations with verified modulus and compaction quality. Ensuring foundation integrity before increasing thickness leads to cost-effective, durable, and sustainable infrastructure investments.

Importance of Compliance with 23 CFR Part 637 Subpart B

Agencies must develop specifications and procedures that comply with 23 CFR Part 637 Subpart B, which establishes quality assurance procedures for construction. This ensures that pavement projects are built to meet durability and performance standards, minimizing premature failures and costly repairs.

In a March 30, 2023, memorandum for Brian Fouch, Director of the Office of Preconstruction, Construction, and Pavements at FHWA, agencies were encouraged to develop new concepts for incentivizing quality (<https://www.fhwa.dot.gov/construction/cqit/QualityPriceAdjustments.pdf>). Incentivizing quality work by contractors, aligns financial compensation with pavement performance and long-term durability. By integrating quality pay requirements, agencies can promote better construction practices, improve pavement foundation quality, and ensure infrastructure investments yield maximum returns.

Reinforcing the Message

As the American Society of Civil Engineers (ASCE) noted in their 2021 Infrastructure Report Card: *“America’s roads are in dire need of modernization (<https://infrastructurereportcard.org/>). The longer we wait to address our deteriorating roads, the more expensive the solutions will become.”* This rings especially true when it

comes to pavement foundations—the best time to ensure quality is during construction, not years later when failures become evident.

The Cost of Inaction

Imagine two highway sections built on I-494 at the same time—one with a properly engineered, verified foundation and the other with outdated, inadequate construction practices. The first highway lasts 30 years and only requires routine maintenance. Due to an unstable foundation, the second section begins showing cracks within ten years, demanding millions in repairs and frequent lane closures that disrupt commerce and daily commutes. This scenario is not hypothetical—it's a reality happening across the country.

Advocating for HF 185: Including Pavement Foundation in the Resilient Pavement Program

HF 185 proposes critical funding to enhance the durability and sustainability of pavement projects in Minnesota by revising designs for longer pavement life. However, no pavement system can achieve a 50-year design life without a properly engineered and verified foundation.

To align with HF 185's goals, we advocate for the bill to explicitly include pavement foundation verification as an essential component of the program by:

1. Requiring **direct verification** of pavement foundation properties before the pavement is placed.
2. Mandating the use of **real-time quality assurance technologies** to ensure that roads are built to last.
3. Incorporating **performance-based pavement foundation specifications**, shifting from outdated empirical methods to engineering-based designs.
4. Allocating funding for pilot projects that integrate modern modulus verification techniques, enabling long-life pavement systems.

Investing in pavement foundation verification ensures that taxpayer dollars are spent on infrastructure that meets the full design expectations, reduces maintenance costs, and extends pavement life. Without addressing pavement foundation quality, the objectives of HF 185 will be significantly compromised.

Conclusion

Incorporating pavement foundation verification into HF 185 is not just an engineering necessity—it is essential for achieving the bill's intended longevity and cost-effectiveness goals. Investment in pavement foundation quality offers a disproportion return relative to building thicker pavements (see Attachment). By ensuring that foundations are properly engineered and tested, Minnesota can build roads that serve the public good for generations to come.