



RESEARCH NEED STATEMENT

Call for Projects 2015

Project Research Title:: Asphalt Mixture Design and Performance Properties by Using a Gyratory Compactor

TDOT Sponsor Director: Brian Egan

List TDOT Research Team Lead: Mark Woods

List TDOT Research Team Members: Hong Park, Ricky Jones, Mike Sanders

1. Define the problem or research requested. What is the goal/objective of the research?

TDOT is currently using the Marshall Mix Design method for designing our fine graded asphalt mixtures. As stated in the Asphalt Institute (AI) Asphalt Handbook, " In the 1930's, Bruce Marshall who was an engineer with the Mississippi Highway Department, developed an asphalt mix design method...After World War II, the method continued to be refined...these test procedures continue to be used for the design and quality control of hot mix asphalt." TDOT has also refined this method over the years by specifying certain criteria to be met. This method has served TDOT well in the past and continues to be effective. Currently the Marshall method does not allow for design of our larger stone mixes due to the size limitations in the design method.

In the early 1990's, the Superpave (SUperior PERforming Asphalt PAVements)system was presented and many states, including Tennessee, experimented and tested this new system. For several justifiable reasons in the 1990's, TDOT did not adopt this mix design method/system, as much other State DOT's had. Over the last 20+ years the Superpave system has been refined and tweaked and adjusted as well.

2. Is this research a continuation of a past or present project?

No Yes

If yes, provide current research project title, RES # and reason for the project continuation.

3. Describe anticipated benefits/expected deliverables.

Research is needed to determine if we should continue to use the TDOT refined Marshall Method, the currently specified Superpave System (AASHTO M323/R35/T312), a modified version of the Superpave system (NCHRP 573), or a modified version including the "best" of both methods. It is also expected that a recommended design method will be presented for larger stone mixtures that we do not currently have.

4. What is your timeline for completion of the research?

2-3 years

5. List the anticipated tasks for this research.

It is expected through laboratory and field sampling of existing well performing mixtures, that these mixtures will be analyzed in the Superpave Gyration Compactor (SGC) to determine how we could define a mixture with the same/similar performance properties and characteristics. Some testing to indicate performance may include, rutting, cracking, moisture susceptibility... of the mixtures. It is also expected that a recommended design method will be presented for larger stone mixtures that we do not currently have.

6. Describe how the project results will be implemented?

The research may show that there is no need to change to a SGC and other refinements to our current procedures are needed, or no changes are needed. Other recommendations based on the analysis may include various aggregate requirements (e.g. FAA, F/E ratio, maximum allowable natural sands), minimum Asphalt contents, gyration levels or requirements (e.g. Nmax), VMA/VFA/Effective AC requirements, Air void design contents (e.g. 5.0% vs. 4.0% for low volume roads).

7. Will this study produce software, web page or other technology that will involve the Information Technology Division?

No Yes, please describe:

8. Will training be provided to employees as a result of this research?

No Yes, please describe:

9. Will this research involve equipment or materials purchase?

No Yes, please describe:

It is expected that most materials will be sampled from projects current projects or be donated. Some equipment may need to be purchased.

10. Research must support the Long Range Transportation Plan Policy Recommendations **and/or** TDOT Operational Goals and/or Strategic Initiative. (See attachments for additional information)

Please indicate which categories the research will support:

Transportation Long Range Plan Policy Recommendations

(A) Accessibility

(B) Safety, Security, and Transportation Resilience

- (C) Coordination, Cooperation, and Consultation
- (D) Demographic and Employment Changes and Trends
- (E) Freight Logistics and Planning
- (F) Financial
- (G) Mobility
- (H) Travel Trends and System Performance

TDOT Operational Goals and/or Strategic Initiative

- (A) Deliver transportation projects on schedule and within budget
- (B) Maintain the state transportation system to protect the long term investment in our infrastructure assets
- (C) Operate and manage Tennessee's transportation system to provide a high level of safety and service to our customers and workers
- (D) Expanding mobility choices to maximize access
- (E) Dramatically change the paradigm for delivery of transportation products and service to improve the efficiency and effectiveness of Tennessee's transportation network

11. Please explain how the research supports the Long Range Transportation Plan Policy Recommendations **and/or** TDOT Operational Goals and/or Strategic Initiative selected above:

The research results will allow TDOT to consider changes to our mix design methods and requirements that will provide for a longer lasting pavement, therefore, saving money, and reducing annual resurfacing costs. Good, smooth pavements are also safer than old, aged, potholed pavements and will provide higher level of safety to our customers.

For additional information, please contact:

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