



LRRB Research Need Statement

LRRB-2

Date: March 8, 2021

	Name	Agency	E-mail	Phone
Need Statement Champion:	LRRB			
Submitted by:	LRRB via Priority Process			
Originated from:	LRRB Idea Solicitation Process (Pre-Screen Board Mtgs)			

Select Type:

Research OR Implementation

Need Statement Title:

Pavement Design: Performance of Base vs Subbase

Need Statement: Describe the problem or the opportunity. Include background and objective.

Since the main working principle of pavements is to distribute the axle loads to the layers beneath the pavement surface course (aggregate base, subbase, and subgrade), these layers play a significant role in the long-term pavement performance. Aggregate base course, the main load-carrying layer, is the first layer beneath the pavement surface course. It is usually constructed by using coarse-grained aggregates to provide a stiff and highly permeable layer. The subbase course is another load-carrying layer beneath the aggregate base course. It is an optional layer, and it is used to increase the efficiency of load distribution and to also separate the aggregate base from and the insitu subgrade. Often relatively lower-quality aggregates are used for subbase materials as compared to the base layer. While it is beneficial to have a thicker base layer over thinner subbase layer in terms of strength/stiffness/drainage, it may not be a cost-effective alternative.

Additionally, one of the main issues with aggregate base materials is the quality of aggregates vary significantly within and between quarries. The varying characteristics for base material include gradation, abrasion resistance, and freeze-thaw durability. If there is a lack of quality in available aggregate base materials, it may be appropriate to build pavement foundation layers with thicker subbase and thinner base layers.

This research will explore options where quality aggregates are in short supply, can there be alternative aggregate designs that utilize more cost effective, but perhaps lower quality aggregate resources? If so, what characteristics should be evaluated – thickness, angularity, hardness, quality of the underlying subgrade? Determining when and how a thicker subbase with a thinner base course should be constructed will guide future designs, especially in areas where quality aggregate resources may be diminishing.

Past research has investigated varying thicknesses of aggregate bases and subbases with different intent: structural integrity, improving drainage, mitigating freeze-thaw. Researchers should evaluate past efforts and then determine knowledge gaps for cost-effective design with readily available resources.



This effort should:

- Guide practitioners in key performance characteristics of aggregate resources when designing base/subbase.
- Determine availability of quality aggregate availability by region along with cost-effective alternatives.
- Provide design guidance that would help local agencies evaluate and access their local materials and assist them in designing the most cost-efficient asphalt pavement structure (specifically the asphalt, base and subbase layer type material and thickness).

Suggested Deliverables:

Design Alternatives and Cost/Benefit Report

How does this project build upon previous research (include title or reference to a completed research effort)?

Three active projects addressing base conditions:

1. [Effectiveness of Geotextiles/Geogrids in Roadway Construction; Determine a Granular Equivalent \(GE\) Factor](#)
2. [Base Stabilization Additives - Effect on Granular Equivalency \(GE\)](#)
3. Evaluation of SFDR Stabilizing Products (Beltrami-Hubbard)

Provide names to consider for a Technical Advisory Panel:

John Siekmeier (MnDOT); Mike Flaagan (Pennington County); Scott Holmes (Olmsted County); Bruce Hasbargen (Beltrami County); Brad Skow (MnDOT); Terry Beaudry (MnDOT) Kent Exner (City of Hutchinson)