



New England Transportation Consortium

NEW ENGLAND TRANSPORTATION CONSORTIUM RESEARCH PROBLEM STATEMENT FORMAT

Due to netc@ctcandassociates.com by January 22, 2021

I. PROBLEM TITLE

“Integration of Asphalt Pavement Structural and Mix Design for Sustainable Infrastructure”

II. RESEARCH PROBLEM STATEMENT

One of major missions of transportation agencies is to provide safe, comfortable, and sustainable asphalt pavements. Although many research activities and design practices have been used over the past century, we are still experiencing rutted, cracked, and pothole prone pavements. These problems are not only dangerous for pavement structures, but they also severely impact limited budgets. One of reasons for poor performance is the use of empirically based asphalt materials parameters in the structural design process, e.g., structural numbers and layer coefficients, which were originally based on visual observation of pavement performance at the American Association of State Highway Officials (AASHO) Road Test in late 1950s and early 1960s. Recognizing the need for a new approach, national research agencies including Transportation Research Board (TRB) and National Cooperative Highway Research Program (NCHRP) developed and promoted a Mechanistic-Empirical Pavement Design Guide (MEPDG). While this represents a major evolutionary step forward, the asphalt mixture properties are not directly linked to the mix-design process, and more importantly quality control (QC) testing.

In the 1980s, the Strategic Highway Research Program (SHRP) modified the existing asphalt mix-design process to more directly relate it to performance and developed Superior Performing Pavement (Superpave) mix-design. Although this volumetric mix-design approach better serves pavement design than previous empirical ones, the implementation of fundamental materials testing during the mix-design process was hampered by a lack of affordable lab equipment and reproducible laboratory tests. However, research activities over the last decades have resulted in the development of affordable, repeatable laboratory tests and procedures for estimating asphalt composites performances, i.e., Balanced Mix Design (BMD). Although BMD may not provide fundamental engineering properties, the results can be used as a surrogate for fundamental properties and be subsequently incorporated into MEPDG.

Although pavement structural and asphalt mix-design have not been linked, technology advancements including MEPDG and Superpave BMD will allow their integration, which will result in longer-lasting, better performing flexible pavements in New England.

III. RESEARCH OBJECTIVES

The research objective is to establish an integration between laboratory performance-related asphalt composites properties and MEPDG structural design to have longer-lasting, better performing flexible pavements in New England. Specific objectives are as follows:

- Summarize pertinent research relating materials/mixture properties resulting from asphalt mix-design to flexible pavement structural design,
- Document the applicability of current/proposed materials/mixture tests – in terms of temperature, load/stress state, and aging conditions – to structural design,
- Develop a proposed durable flexible pavement structure utilizing the results of (1) and (2) for longer-lasting, better performing flexible pavements in New England,
- Identify the unique structural and performance requirements of each asphalt layer (asphalt surface, intermediate, and base) within a flexible pavement system,
- Identify gaps in current knowledge regarding the effect(s) of asphalt composites properties on the structural design of flexible pavements,
- Fill the gaps in current knowledge about integration of asphalt mix-design and MEPDG procedure,
- Link performance-related mixture testing protocols to various field distresses and conditions,
- Correlate mixture performance test results and MEPDG procedure,
- Develop protocols to use MEPDG or AASHTOWare Pavement ME Design (PMED) software to better serve the material input needs, and
- Recommend a framework for a study to confirm/validate the findings of this project in the field.

IV. COST ESTIMATE

The total cost of proposed two-year research project would be \$195,000.

V. RESEARCH PERIOD

The number of months to complete the research would be 24 months.

VI. URGENCY AND PAYOFF POTENTIAL

The successful completion of this research project will lead to time/cost savings, enhanced practice/performance and improved safety.

VII. IMPLEMENTATION POTENTIAL

To aid NETC in deciding whether to fund this project, describe:

- *The intended transportation agency audience(s) for using the research products.*
Design and materials engineers
- *Type of implementation anticipated as a result of the project (i.e. confirm existing, adopt new or eliminate current standards, specifications, processes, policies, regulations or drawings, GIS application).*
Adopt new AASHTOWare Pavement ME Design (PMED) for structural design and Superpave BMD.
- *Activities to facilitate implementation (e.g. brochures, posters, exhibits at conferences, tech sheet summaries, webinars, presentations, training workshops, peer exchanges, pilot or demonstration project at host agency) to help create awareness and facilitate implementation of the research results.*
Tech Sheet Summaries, Training workshops, Presentations, Webinars, etc.
- *Anticipated barriers or constraints to implementation and ways to overcome them.*
None
- *Methods of tracking and measuring the impacts of implementation.*
Field performance observation

TWO TRANSPORTATION AGENCY STAFF ENDORSEMENTS ARE REQUIRED

(To be signed by separate individuals.)

VIII. ENDORSEMENT BY THE SPONSORING TRANSPORTATION AGENCY REPRESENTATIVE TO THE NETC ADVISORY COMMITTEE

By signing the endorsement, the transportation agency representative is certifying that:

1. *The Research Problem Statement follows the required format.*
2. *The Research Problem Statement addresses a transportation issue of relevance to NETC and does not duplicate another Research Problem Statement being submitted at this time.*

Christos S. Xenophonos, Assistant Director

Name

RIDOT

Transportation Agency



Signature*

1/21/2021

Date

ENDORSEMENT BY THE SPONSORING TRANSPORTATION AGENCY RESEARCH PROBLEM STATEMENT AUTHOR/SUBMITTER

By signing the endorsement, the transportation agency Research Problem Statement author/submitter is certifying that:

1. *I have technical knowledge of the project topic and will be committed to the research outcome.*
2. *I agree to serve as Chair of the project's Technical Committee if this Research Problem Statement is selected for funding by NETC.*

Kathleen Wilson, PhD

Name

RIDOT

Transportation Agency



Signature*

1/21/21

Date

*Electronic signatures are acceptable.

NOTE: To expedite the processing of Research Problem Statements, NETC requires submittal by e-mail from signing Advisory Committee member to (netc@ctcandassociates.com) by January 22, 2021.