

2019 Research Showcase

Balanced Mix Design (BMD) for Asphalt Mixtures

& STIC Annual Meeting

PROJECT TITLE

Balanced Mix Design (BMD) for Asphalt Mixtures

STUDY TIMELINE

Ongoing

VTRANS CONTACTS

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This fact sheet was prepared for the 2019 VTrans Research Showcase & STIC Annual Meeting held at the Dill Building in Berlin, VT, on September 11, 2019 from 8:30 am– 1:00 pm.

Fact sheets can be found for additional projects featured at the 2019 Symposium at

<http://vtrans.vermont.gov/planning/research/2019showcase>

Additional information about the VTrans Research Program can be found at

<http://vtrans.vermont.gov/planning/research>

Additional information about the VTrans STIC Program can be found at

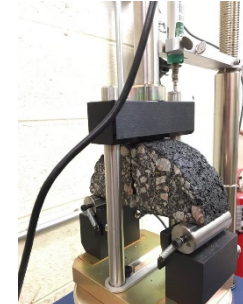
<http://vtrans.vermont.gov/boards-councils/stic>

Introduction

There has been an increased need to develop performance – related specifications for asphalt mixtures on VTrans projects due to severe rutting and cracking distresses occurring prematurely after construction. One aspect of performance – related specifications is an emerging design principle known as balanced mix design (BMD). The goal of BMD is to optimize asphalt mix designs such that rutting, cracking, and moisture susceptibilities have an equal chance of occurring, and are minimized.

Two (2) tests have been identified for implementation of a BMD approach. They are:

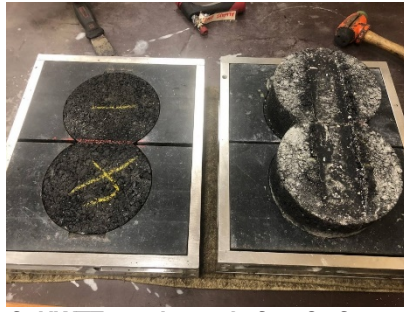
- Hamburg Wheel Tracker Test (HWTT) to analyze rutting and moisture susceptibility
- Illinois Flexibility Index Test (I-FIT) to analyze cracking susceptibility.



Left: HWTT equipment in Hot-mix lab. Right: I-FIT equipment with specimen loaded for testing

Action Taken

- 2015: HWTT equipment purchased by the Agency
- 2015 – 2017: Rutting and moisture susceptibility testing performed in Hamburg on box samples collected on QA projects during production.
- 2017: I-FIT equipment purchased by the Agency using SHRP2 R07 funds
- 2017 – 2018: Preliminary data analysis on HWTT results from 2015 – 2017 testing performed by UVM
- 2018 – 2019: Continued rutting and moisture susceptibility testing performed in Hamburg on collected box samples, as well as cracking susceptibility testing performed with I-FIT equipment.
- 2019: Project Special Provision (PSP) with pass/fail criteria for mix design qualification included on two (2) projects; a General Special Provision (GSP) requiring HWTT & I-FIT results be submitted with all mix designs goes into effect.



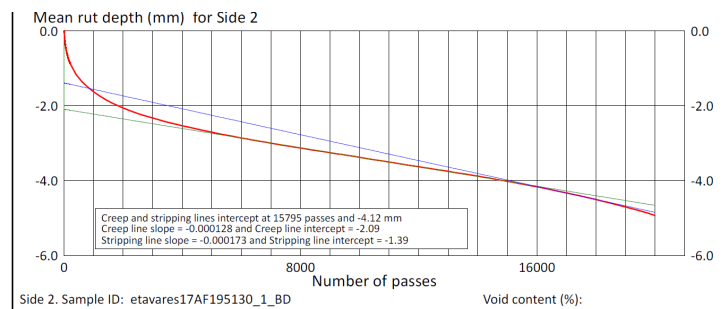
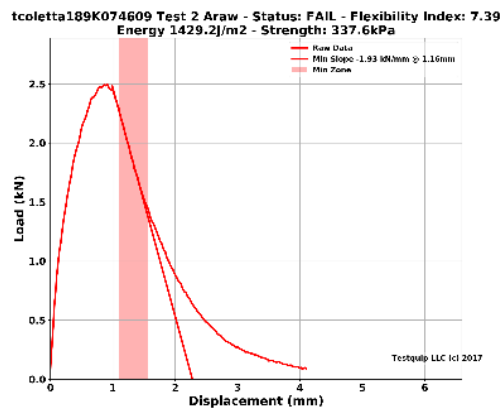
Left: HWTT specimens before & after testing. Right: I-FIT specimens post-testing

Next Steps

- Continue to analyze HWTT & I-FIT data to determine further refinements to existing VTrans specifications.
- Conduct further statistical analysis on VTrans test data and any test data available from the Contractors.

Potential Impacts and VTrans Benefits

Implementation of BMD would allow VTrans to identify asphalt mix distresses before production as a verification tool, and potentially during Quality Assurance (QA) testing with associated incentive/disincentive pay factors. In addition, BMD will also enable VTrans to identify the engineering properties of asphalt mixtures with new materials (i.e., recycled asphalt materials) and technologies (warm-mix, rejuvenators, aromatic oils, etc.).



Rut depths (mm)		
Pass No.	Side 1	Side 2
5000	-2.46	-2.71
10000	-3.15	-3.38
15000	-3.93	-4.02
20000	-4.77	-4.93

Mix type:
 Asphalt grade:
 HMA Production: Laboratory
 Compaction method: SGC
 Mix source:
 Test temperature (°C): 45.0
 Mix depth (mm): 61.0

Top: Example of I-FIT load vs. displacement curve with failing Flexibility Index (FI) result.
 Bottom: Example of HWTT rut depth vs. number of passes plot and passing test result summary