



# Construction Quality in the Alternate Project Delivery Environment

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ASCE  
PRESS

# BMD – MIX PERFORMANCE TESTS



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# AGENDA TOPICS

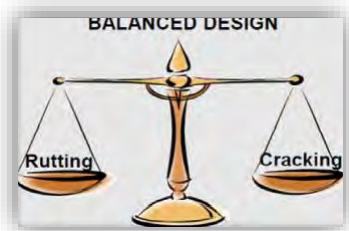
## Balanced Mix Design Implementation



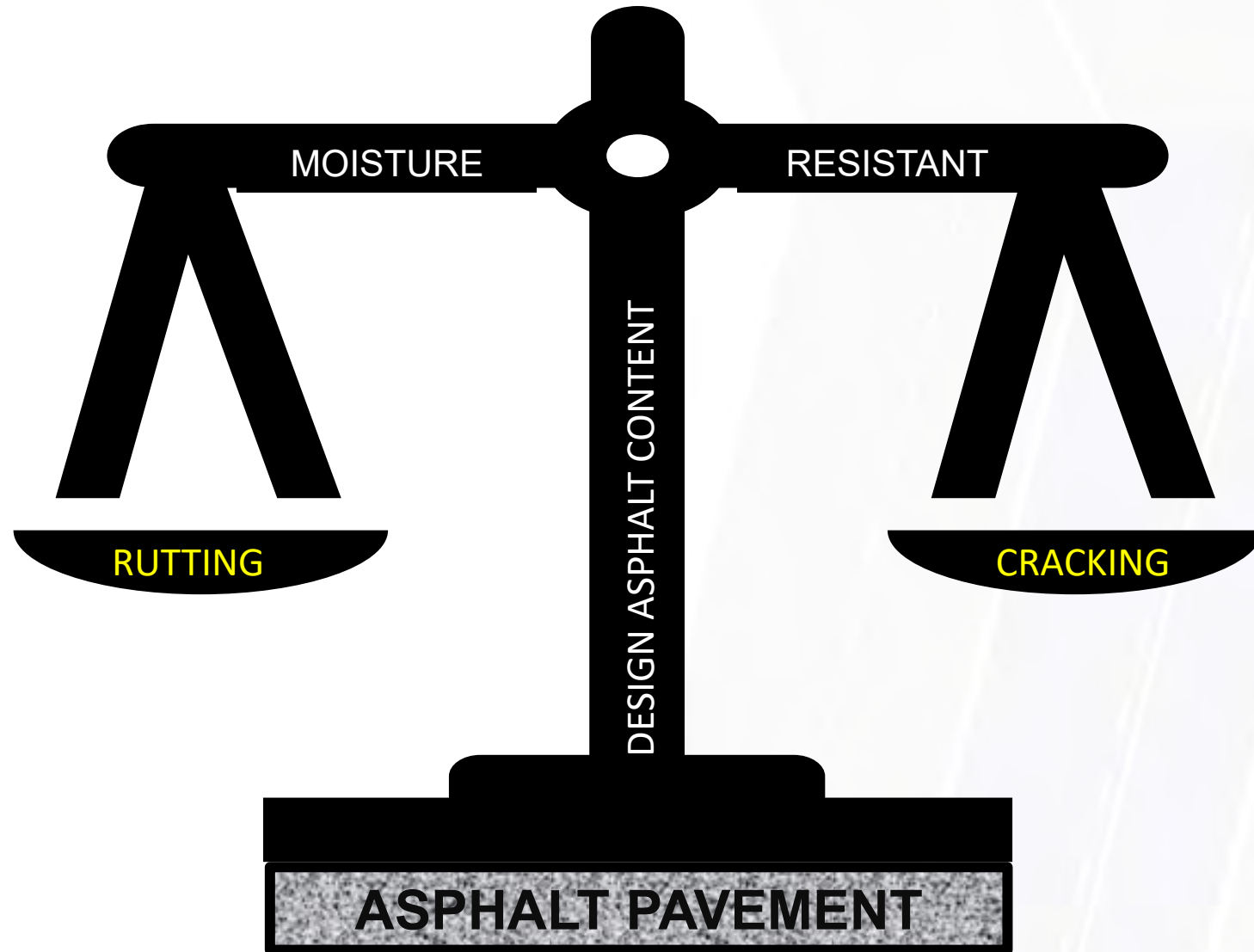
# BALANCED MIX DESIGN (BMD)

## Definition - BMD

**“Asphalt mix design using performance tests on appropriately conditioned specimens that address multiple modes of distress (i.e., rutting & cracking) taking into consideration mix aging, traffic, climate and location within the pavement structure.”**



# BALANCED MIX DESIGN (BMD)



# BALANCED MIX DESIGN (BMD)

## Asphalt Mix Design Performance Tests

Cracking  
Resistance

Min

Rutting  
Resistance

Min

Acceptable  
AC Range

4%, 5%, 6%+

Asphalt Content



# BALANCED MIX DESIGN (BMD)

RUTTING ←

PERFORMANCE TESTS

→ CRACKING

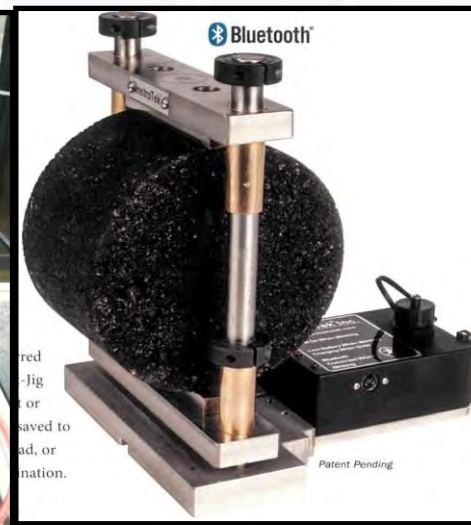
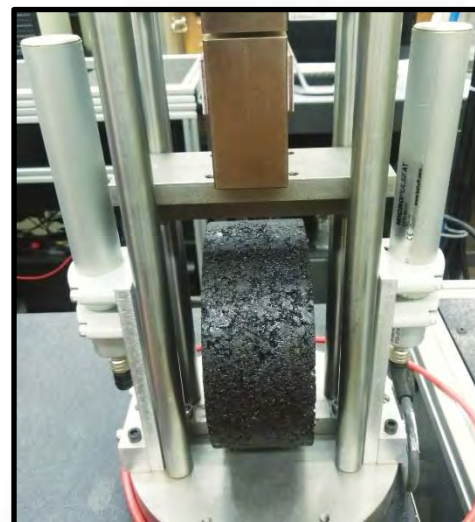
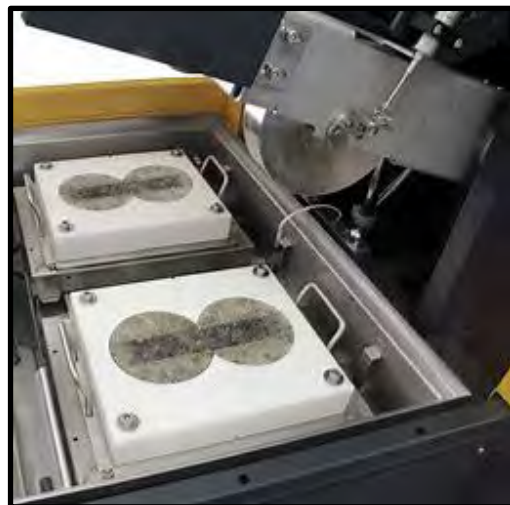
## HWTT AASHTO T324

- Lab produced samples only for this pilot.
- Gyrotory samples %7.0 (+/- 0.5%) air voids.
- Test run at 122° F (50° C).
- All samples tested to 20,00 cycles or 15mm rut depth, whichever comes first.
- May replace AASHTO T283 (TSR) eventually for moisture susceptibility.



## IDEAL-CT ASTM D8225

- Gyrotory samples %7.0 +/- %1.0 air voids (lab).
- Test run at 25° C (77°F).
- Applies load at 50mm / min.
- CT Index considers the Fracture energy, and post peak slope, and displacement at 75% peak load after failure.

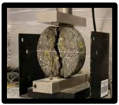


# BALANCED MIX DESIGN (BMD)

HWTT ← TENTATIVE TEST THRESHOLDS → IDEAL-CT

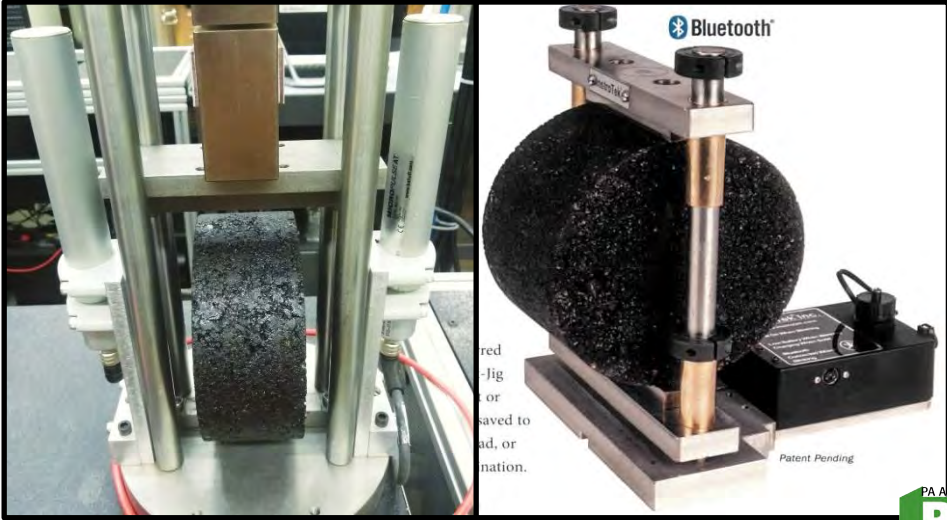
HWTT AASHTO T324

- 6mm @ 20,000 cycles
- 12mm @ 10,000 cycles
- Stripping inflection point TBD for moisture susceptibility. Replace or supplement TSR 283.



IDEAL-CT ASTM D8225


- Minimum score of 70.





# BALANCED MIX DESIGN (BMD)

## HWTT & CT-Index SSP 2021

- Standard Special Provision approved by FHWA Jan. 25, 2021.
- HWTT & CT-Index testing results are for information only in 2021.
- Solicitation letter sent to Districts asking that a minimum of 5 projects in the 2021 construction season with anticipated final inspection dates before October 31, 2022.
- A PDA shall be inserted into each project for payment of \$1,500 per JMF on the project.
  - This will probably be the last year for payments for testing.
-  wants to encourage producers to procure their own equipment
  - HWTT - \$55,000 TO \$75,000
  - IDEAL-CT - \$5,000 TO \$10,000


# BALANCED MIX DESIGN (BMD)

## LETTER TO DISTRICTS REQUESTING PROJECTS

- Feb 9, 2021, memo (SSP) to Districts requesting project candidates for HWTT and IDEAL-CT Testing.

56 PROJECTS FOR 2021 CONSTRUCTION SEASON

OS-600C (12-15)

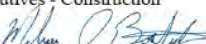
 **pennsylvania**  
DEPARTMENT OF TRANSPORTATION

**MEMO**

**DATE:** February 9, 2021

**SUBJECT:** Request for Asphalt Candidate Projects for Hamburg Wheel Track (HWT) and Cracking Tolerance Index (CT<sub>Index</sub>) Testing Pilot Specification

**TO:** District Executives  
Assistant District Executives - Construction

**FROM:** Melissa J. Batula, P.E.   
Deputy Secretary for Highway Administration

This memo provides direction and guidance for the incorporation of the attached standard special provision on projects as follows:

- The intent of this pilot is for districts to include the attached special provision on a minimum of 5 projects in the 2021 construction season let by October 21, 2021, with an anticipated final inspection date before October 31, 2022.
- The project can contain any superpave asphalt wearing course and/or binder course material. Base course material is excluded from this pilot project.
- Districts are encouraged to select projects to be let as soon as possible with paving taking place as soon as possible.
- The district may consider both state and federal oversight projects as candidate projects.
- The district should review the attached Instructions for Use.

The SSP was distributed through the clearance transmittal process and approved by FHWA on January 25, 2021.

The HWT and CT<sub>Index</sub> Testing Standard Special Provision requires contractors to provide performance testing of laboratory produced asphalt material. The testing results are not required to be provided until the project's final inspection. The testing results are intended to give the department and asphalt producers information needed to evaluate current asphalt mixtures for rutting, cracking, and moisture susceptibility performance. The gathered data will help the department evaluate testing method protocols, set testing limits, and move toward implementation of balanced mix design specifications. Please note that districts will be required to submit test results in a provided spreadsheet format, or a centralized data site set up by our research team.

- The intent of this pilot is for districts to include the attached special provision on a minimum of 5 projects in the 2021 construction season let by October 21, 2021, with an anticipated final inspection date before October 31, 2022.
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# BALANCED MIX DESIGN (BMD)

## LETTER TO DISTRICTS RE: BMD IMPLEMENTATION PLAN

- June 8, 2021, memo to Districts laying out **five-year implementation plan** for BMD with Performance Tests



June 8, 2021

To: All Producers of Asphalt Mixtures (Pub. 41, Bulletin 41)

Re: Implementation of the AASHTO T324 Hamburg Wheel Track Test (HWTT) and Evaluation of the Cracking Tolerance Index (CT(Index)) Test for Balanced Mix Designs of Asphalt Pavement Mix Designs in Pennsylvania

Dear Producers,

Over the past several years through the Long-Life Asphalt Pavement program, the Department has been evaluating and working toward implementation of an asphalt pavement balanced mix design process. Because of the obvious advantages of the AASHTO T324 Hamburg Wheel Tracking Test (HWTT), the time has come for the Department to commit and implement the HWTT for the evaluation of rutting potential in Pennsylvania asphalt pavement mixtures. The Department will also continue the evaluation of the ASTM D8225 CT<sub>(Index)</sub> test for possible future implementation. Producers will have the option of using an AASHTO re-source

# BMD IMPLEMENTATION PLAN

- June 8, 2021, memo to Districts laying out **five-year implementation plan** for BMD with Performance Tests.

**2021 Construction Season** – Districts have/will include the attached standard special provision on selected projects in the 2021 construction season. Payments will be made for the HWTT and CT(Index) testing as outlined in the standard special provision. Information only test results will be reported in the Remarks section of the JMF input within the eCAMMS system.

**2022 Construction Season** – For JMFs approved for the 2022 calendar year, Asphalt producers are encouraged to complete for information only HWTT and CT(Index) testing results to be entered into the remarks section of the eCAMMS system for as many JMF wearing course submissions as possible. HWTT and CT(Index) testing costs will be considered incidental to JMF approval for all 50-yr wearing course JMFs approved after 12/1/2021.

# BMD IMPLEMENTATION PLAN

- June 8, 2021, memo to Districts laying out **five-year implementation plan** for BMD with Performance Tests.

**2023 Construction Season** – For JMFs approved after 12/1/2022, all 50 -gyration wearing course JMFs submitted for approval will require for information only HWTT and CT(Index) testing results entered into the remarks section of the eCAMMS system before JMF approval unless approved otherwise by the DME (refer to General Requirements Section). HWTT and CT(Index) testing costs will be considered incidental to the JMF approval for all 50-gyration wearing course JMFs approved after 12/1/2022. **This is approximately 800 mix designs!**

**2024 Construction Season** – All wearing course JMFs submitted for approval after 12/1/2023 will require for information only HWTT and CT(Index) testing results entered into the remarks section of the eCAMMS system before JMF approval unless approved otherwise by the DME (refer to General Requirements Section). HWTT and CT(Index) testing costs will be considered incidental to the JMF approval for all wearing and binder course JMFs approved for the 2024 calendar year.

**2025 Construction Season** – By 12/1/2024 the Department will establish HWTT testing limits and implement them for all wearing and binder course JMF approvals for JMFs approved for the 2025 calendar year.

# BMD IMPLEMENTATION CHALLENGES

## Implementation – Need .

- Pick performance test(s) **80%**
- Decide on test protocols. **75%**
- Sample aging protocols **50%**
- Specification pilot(s). **40%**
- Who will be doing testing and how large of an investment is the equipment? **10%**
  - Contractors / Producers
  - Special Testing Labs
  - LTS
- Determination of acceptance limits **25%**
- Enough lead time between project bid and paving?
- Trained technicians to run testing? **5%**
- **NECEPT CONTRACT to assist with implementation in progress of being finalized**

# PA ASPHALT PAVEMENT ASSOCIATION

Thank you for your attention!



Please contact us for any assistance!

Charles C Goodhart – Executive Director

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Gary L. Hoffman, P.E. – Director of Technical Services

[gary@pa-asphalt.org](mailto:gary@pa-asphalt.org)