# Percent within Limits (PWL), AASHTOWARE, Asphalt Analyzer, HMA Materials Research and Balanced Mix Design (BMD):

## An Update on WisDOT's Current Practice and Future Plans

December 2nd-3rd, 2025

WAPA Annual Conference

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Bureau of Technical Services, WisDOT

# BTS HMA Materials Personnel

- Casey Wierzchowski – HMA Materials Supervisor
- Dan Kopacz – Statewide HMA Pavement Engineer
- Jeffery Anderson – HMA Mix Design Specialist
- Matthew Andreini – HMA Performance Testing Specialist
- Jon Schave– HMA Binder Lab Coordinator
- Brian Jandrin – Nuclear Program Specialist
- Albert Kilger – HMA Engineer

# Future HMA Spec changes

- AASHTOware timeline

  (Concurrent Breakout AASHTOWare Materials and WisDOT Specification)
- Highlights of Upcoming AWP Spec Reorg:
  - Mixture Use Table required for all mixture applications.
  - QMP is replaced by either PWL or Department Acceptance programs.
    - Density – PWL & Department Acceptance
      - Cores and Correlated Gauges
    - Mixture – PWL, PWL Lite, & Department Acceptance
      - No Volumetric Test Strips for PWL Lite

# AASHTOware timeline

- 3 pilots for 2026
- More pilots 2027
- Full implementation 2028?

# Future HMA Spec changes

- Quality Acceptance Programs

| | |
|---|---|
| | Mixture Acceptance Programs |
| 705.1.2 | General Requirements for Asphalt Mixture Testing |
| 705.1.3.1 | HMA & SMA Volumetric Test Strips |
| 705.1.3.2 | Percent Within Limits |
| 705.1.3.3 | Percent Within Limits Lite |
| 705.1.3.4 | Department Acceptance |
| 705.1.3.5 | Small Quantities |
| 705.1.3.6 | Temporary Pavements |
| | Density Acceptance Programs |
| 705.1.4 | General Requirements for Asphalt Density Testing |
| 705.1.5.1 | Nuclear Gauge Correlation Strip |
| 705.1.5.2 | Percent Within Limits |
| 705.1.5.3 | Department Acceptance |
| 705.1.5.4 | Small Quantities |
| 705.1.5.5 | Temporary Pavements |

# Future HMA Spec changes

- Mixture Use Table required for all mixture applications.

| Description | Station / Location | Mixture Use | Underlying Surface | Bid Item | Tons | Thickness | Quality Management Program to Use | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | Mixture Acceptance | Density Acceptance |
| 12-foot Driving Lane | 1+00 to 20+39 | Lower Layer | Milled Existing HMA Surface | HMA Pavement 3 MT 58-34H | 15,400 | 2.75" | PWL | PWL Nuclear Gauge |
| 12-foot Driving Lane | 1+00 to 20+39 | Upper Layer | 3 MT 58-34H | HMA Pavement 4 MT 58-34H | 12,000 | 1.75" | PWL | PWL Nuclear Gauge |
| 3-foot Shoulder | 1+00 to 20+39 | Lower Layer | Milled Existing HMA Surface | HMA Pavement 3 MT 58-34H | 3,850 | 2.75" | PWL | Department Acceptance Cores* |
| 3-foot Shoulder | 1+00 to 20+39 | Upper Layer | 3 MT 58-34H | HMA Pavement 4 MT 58-34H | 2,450 | 1.75" | PWL | Department Acceptance Cores* |
| Culvert Patches | Various | Patch | Base Aggregate | Asphaltic Surface Patching | 550 | 6" total | N/A | Ordinary Compaction (SS 450.3.2.7.2) |
| 12-foot Driving Lane | 20+39 to 23+00 | Lower Layer | Existing Concrete Pavement | HMA Pavement 3 MT 58-34H | 1,570 | 2.75" | PWL Lite | Department Acceptance Cores* |
| 12-foot Driving Lane | 20+39 to 23+00 | Upper Layer | 3 MT 58-34H | HMA Pavement 4 MT 58-34H | 1,000 | 1.75" | PWL Lite | Department Acceptance Cores* |
| 10-foot Shoulder | 20+39 to 23+00 | Lower Layer | Existing Concrete Pavement | HMA Pavement 3 MT 58-34H | 1,310 | 2.75" | PWL Lite | Department Acceptance Cores* |
| 10-foot Shoulder | 20+39 to 23+00 | Upper Layer | 3 MT 58-34H | HMA Pavement 4 MT 58-34H | 830 | 1.75" | PWL Lite | Department Acceptance Cores* |

*Department Acceptance Cores are cut and tested by the contractor under the supervision of the engineer. The department will maintain custody of the cores.

# Core Handling Procedures

- CoreDry equipment needs to accomplish the following:
  - Pull the correct vacuum to properly remove moisture from the core.
    - Too much vacuum can damage cores.
    - Too little vacuum and cores will not fully dry.
  - Not damage cores by overheating.

Follow the checklist for the CoreDry equipment to help resolve these issues.

## Troubleshooting Checklist for InstroTek CoreDry

- ✓ **Verify machine software is up to date.**
  - If your machine is older than 7 years, it might not be up to date.
- ✓ **Run the self-test.**
  - Note: Units with serial numbers 499 and below that have been upgraded do not include a self-test feature. According to InstroTek, "Upgraded units under serial #500 do not have the current sensors in them for the self-test. Even if upgraded. That menu function is called System Settings. The current sensors are too difficult to put into the units when upgrading them."
  - Before using Self-Test place both lids on sample tank and Cold Trap. The Self-Test switches between the individual parts of the CoreDry to isolate and determine the operational status of each part. The Self-Test will switch between the valves, relay, pump, +Line, and Power Supplies. Once the Self-Test is completed the CoreDry will display the results of the Self-Test as well as all of the current settings.
- ✓ **Run the daily test every day before running samples.**
  - Before operating, dry the cold trap and sample chamber with a lint free cloth.
  - Place lids on sample chamber and cold trap. Press start to begin a test without any samples. The vacuum reading on the display should be 6mmHg or less when complete.
    - After transport to other locations, you might have to run the CoreDry several cycles to achieve 6 mmHg. Moisture from humidity might build up within the vacuum lines. By running the unit several times, the CoreDry eliminates the moisture in the pipes and reduces the pressure within the chamber to 6 mmHg.
- ✓ **Sample must be at room temperature or higher <u>not to exceed 110F (~43C)</u>.**
  - If the sample is not dry after 45 cycles, remove the sample and place at room temperature for 15 minutes. After 15 minutes it is ok to put the sample back in the sample chamber and complete the drying with the CoreDry.
- ✓ **Maintenance Schedule**
  - Tank Filter pads
    - Replace every 2-3 weeks or when dust or debris is present. A screen will alert you when it is recommended to change the filters.
      - Part Number: 977.1004
  - Vacuum Pump Oil
    - Replace every 2-3 months or every 80 hours, whichever comes first.
      - Part Number: 419.0005
  - Vacuum Exhaust Filter
    - Replace every year or when vacuum does not reach 6mmHg with daily test.
      - Part Number for Serial Numbers that contain "B" in them: 977.1006
      - Part Number for Serial Numbers that contain "KB/RA" in them: 977.1005
  - Verify Vacuum Pressure Reading
    - Verify every 6 months with Absolute Vacuum Gauge. Refer to manual for procedure.
      - Part Number: 203.1006

## Troubleshooting Checklist for Troxler CoreDry

- ✓ **Verify machine software is up to date.**
- ✓ **Run the Pressure and Leak Test at the start of every day**
  - Troxler recommends running these tests twice per day. The pressure check automatically adjusts the CoreDry for changes in atmospheric pressure.
  - This test runs when the machine is turned on and can be run again from the settings menu.
- ✓ **Samples**
  - Should not contact the sides of the chamber.
  - Samples that are not dry within 40 cycles should be removed from the CoreDry to prevent overheating.
    - Samples should be allowed to cool for 30 minutes until the sample has cooled before continuing to dry the sample.
  - Verify the core profile is selected in the settings.
- ✓ **Maintenance Schedule**
  - Daily – Before Using
    - Dry sample chamber with a lint-free cloth.
    - Perform the pressure check.
  - Daily – End of Day
    - Run Pump Cleaning Cycle at the end of everyday that the CoreDry is used. This cleans out moisture which may accumulate in the pump.
  - Every 2-4 samples
    - Dry the moisture reservoir and filter.
    - Dry cold trap (if included).
  - Vacuum Pump Oil
    - Replace oil every 40-hours of pump operation. The machine tracks run times and will notify you when it is time to change the oil.
    - Replace the reservoir filter when performing oil changes.
    - Clean the sample chamber with BindOff or residue cleaner.
  - Yearly
    - Change the batteries.

# Checklist for CoreDry machine

- Calibrate when moving or every 6 months.
  - Includes checking vacuum with the manometer.
- Let the CoreDry cool down after running each core.
  - Verify chamber temperature is below 110°F with handheld thermometer before starting the next core.

# Core Handling Procedures

## Core Testing Checklist

- Cores must be cut at the layer interface.
- Cores must not be frozen or too hot (above 60°F / below 85 °F).
  - Ice may be used in the cooler if the cores are still hot from paving, otherwise, do not use ice.

1. Take initial “wet” weight of core (this provides a starting point reference).
2. Run drying procedure twice.
   - See AASHTO/MOTP.
   - Weigh after each time.
3. Take Submerged weight.
4. Take SSD weight.

# Core Testing

- Possible Testing Issues
  - Testing Frozen Cores
  - Chamber too hot
  - CoreDry vacuum too low or too high

# Core Handling Procedures – Drying Cores Twice

- Controversial topic.
- Data will be reviewed.
- Further discussions this winter.
- Share data.

# PWL Updates / Lessons Learned

- PWL Dispute Sample Submittals.
- Dispute analysis for PWL data, highlight differences between QC/QV and BTS.

# PWL Dispute Sample Submittals

- Create standardized email for dispute initiation.
- Checklist for items in the email.
  - Spreadsheet attached or a link to spreadsheet.
  - Reasons for dispute (including spec. language).
  - Which lots are involved / Sublots to be tested.
- Future emails will include the results and the resolution.

# PWL Dispute Sample Submittals Cont.

- Resolution will be testing is complete, more testing needed by the region, or contractor disputes the lot.
- Final email will include the spreadsheet, summary of test results, pay results, final resolution.
- Email will include:
  - Project staff
  - Region Materials Engineer
  - BTS-HMA Unit
  - Contractor

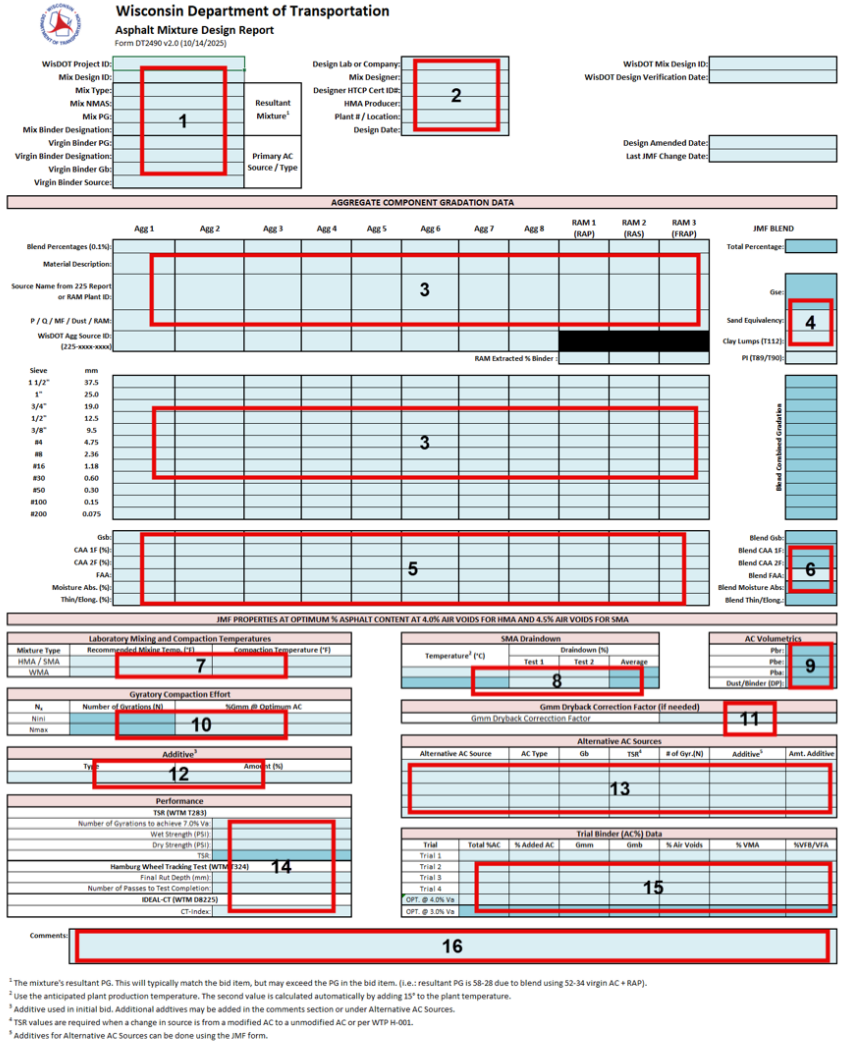
# DT2490

- New DT Form that replaces 249-Form/Report for Mix Design Submittals.
- Will be available on WisDOT Forms website.
  - https://wisconsindot.gov/pages/global-footer/formdocs/default.aspx
- Largely the same but with QOL Improvements including:
  - One-Click button export for .txt files for MRS.
  - Automation features based on mix types.
  - Improvements to readability and clarity.

# Wisconsin Department of Transportation

## Asphalt Mixture Design Report

Form DT2490 v2.0 (11/14/2025)




**Mix Design Data Entry Instructions**

Macros MUST be enabled for this worksheet to function correctly. Fill out the cells and sheets in the form that are light blue. Dark blue cells and sheets are calculated automatically as data is entry is completed. Use the button at the bottom of this sheet to Export for MRS.

**Field Descriptions**

1. Project Information, i.e.: WisDOT Project Number, Mix Design ID Number, Mix Type, Primary AC Source/Type (PG, Specific Gravity (Gb), Supplier) (Combined Bid Binder designation is S, H, V, or E). Complete this section first, other parts of the worksheet will depend on the information you enter here.

2. Mix Designer Information, i.e.: Company Name, Mix Designer Name, HTCP Certification Number, Producer, Plant Number/Location, Design Date.

3. Aggregate Properties, i.e.: Gradation, Blend Percentages, Material Descriptions, Source Names (as they appear on the 225-Report), WisDOT Aggregate Quality ID Number (225-xxxx-xxxx), RAM Extracted AC Percent.

4. Aggregate JMF Blend for Aggregate Effective Specific Gravity (Gse), Sand Equivalency (SE), Clay Lumps and Friable Particles (AASHTO T112), and Plasticity Index (PI) of the Mineral Filler AASHTO T89/T90 (SMA and Interlayer Only - only appears when Mix Type is either <blank>, SMA, or Interlayer).

5. Aggregate properties for Aggregate Bulk specific Gravity (Gsb), Fractured Face (one and two faces), Fine Aggregate Angularity (Method A), Moisture Absorption, Thin and Elongated Pieces.

6. Aggregate JMF Blend for Fine Aggregate Angularity (AASHTO T304) Method A - from JMF blend.

7. HMA/SMA or WMA Recommended Laboratory Mixing Temperature and Compaction Temperature.

8. SMA Draindown (SMA Only - only appears when Mix Type is either <blank> or SMA)

9. AC Volumetrics: Calculated Pbr, Pbe, Pba, Dust/Binder Ratio (DP)

10. Compaction Effort (number of Gyrations (N) and %Gmm at Optimum Asphalt Content at Nini, Nmax.

11. Gmm Dryback (%).

12. Additive name/type/quantity.

13. Alternate Sources (Binder), i.e.: Name, Type, Specific Gravity (Gb), TSR (if applicable), # of gyrations, additives and amount.

14. Performance Test Results (TSR, Hamburg Wheel Track Test*, and IDEAL-CT*). *Information Only

15. Trial AC Data for minimum 3 trial points and maximum of 4. Also include the results of the trial at the Optimum Asphalt Content (calculated either mathematically or graphically) at the mixture's design air void target.

16. Comments related to the mix design.

Export for MRS

**Exporting for MRS**

After all the data is entered, click the "Export for MRS" button to the left and select the location to save the file. You will need to upload the exported .txt file to MRS .

# Wisconsin Department of Transportation

## Asphalt Mixture Design Report

Form DT2490 v2.0 (11/14/2025)

| | | | | | |
|---|---|---|---|---|---|
| WisDOT Project ID: | | Design Lab or Company: | | WisDOT Mix Design ID: | |
| Mix Design ID: | | Mix Designer: | | WisDOT Design Verification Date: | |
| Mix Type: | Resultant Mixture[1] | Designer HTCP Cert ID #: | | | |
| Mix NMAS: | | HMA Producer: | | | |
| Mix PG: | | Plant # / Location: | | | |
| Mix Binder Designation: | | Design Date: | | | |
| Virgin Binder PG: | Primary AC Source / Type | | | Design Amended Date: | |
| Virgin Binder Designation: | | | | Last JMF Change Date: | |
| Virgin Binder Gb: | | | | | |
| Virgin Binder Source: | | | | | |

### AGGREGATE COMPONENT GRADATION DATA

| | Agg 1 | Agg 2 | Agg 3 | Agg 4 | Agg 5 | Agg 6 | Agg 7 | Agg 8 | RAM 1 (RAP) | RAM 2 (RAS) | RAM 3 (FRAP) | JMF BLEND |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Blend Percentages (0.1%): | | | | | | | | | | | | Total Percentage: |
| Material Description: | | | | | | | | | | | | |
| Source Name from 225 Report or RAM Plant ID: | | | | | | | | | | | | Gse: |
| P / Q / MF / Dust / RAM: | | | | | | | | | | | | Sand Equivalency: |
| WisDOT Agg Source ID: (225-xxxx-xxxx) | | | | | | | | | | | | Clay Lumps (T112): |
| | | | | | | | | | RAM Extracted % Binder : | | | PI (T89/T90): |

| Sieve | mm | | | | | | | | | | | | Blend Combined Gradation |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 1/2" | 37.5 | | | | | | | | | | | | |
| 1" | 25.0 | | | | | | | | | | | | |
| 3/4" | 19.0 | | | | | | | | | | | | |
| 1/2" | 12.5 | | | | | | | | | | | | |
| 3/8" | 9.5 | | | | | | | | | | | | |
| #4 | 4.75 | | | | | | | | | | | | |
| #8 | 2.36 | | | | | | | | | | | | |
| #16 | 1.18 | | | | | | | | | | | | |
| #30 | 0.60 | | | | | | | | | | | | |
| #50 | 0.30 | | | | | | | | | | | | |
| #100 | 0.15 | | | | | | | | | | | | |
| #200 | 0.075 | | | | | | | | | | | | |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Gsb: | | | | | | | | | | | | Blend Gsb: |
| CAA 1F (%): | | | | | | | | | | | | Blend CAA 1F: |
| CAA 2F (%): | | | | | | | | | | | | Blend CAA 2F: |
| FAA: | | | | | | | | | | | | Blend FAA: |
| Moisture Abs. (%): | | | | | | | | | | | | Blend Moisture Abs: |
| Thin/Elong. (%): | | | | | | | | | | | | Blend Thin/Elong.: |

### JMF PROPERTIES AT OPTIMUM % ASPHALT CONTENT AT 4.0% AIR VOIDS FOR HMA / 4.5% AIR VOIDS FOR SMA / 2.0% AIR VOIDS FOR INTERLAYER / 1.0% AIR VOIDS FOR POLYMER-MODIFIED HMA OVERLAY

**Laboratory Mixing and Compaction Temperatures**

| Mixture Type | Recommended Mixing Temp. (°F) | Compaction Temperature (°F) |
|---|---|---|
| HMA / SMA | | |
| WMA | | |

**Gyratory Compaction Effort (% Gmm at Optimum AC at Design Va)**

| $N_x$ | Number of Gyrations (N) | %Gmm @ Optimum AC |
|---|---|---|
| Nini | | |
| Nmax | | |

**Additive[3]**

| Type | Amount (%) |
|---|---|
| | |

**Performance (at Optimum AC at Design Va)**

| | |
|---|---|
| **TSR (WTM T283)** | |
| Average Number of Gyrations to achieve Target Va: | |
| Wet Strength (PSI): | |
| Dry Strength (PSI): | |
| TSR: | |
| **Hamburg Wheel Tracking Test (WTM T324)** | |
| Final Rut Depth (mm): | |
| Number of Passes to Test Completion: | |
| **IDEAL-CT (WTM D8225)** | |
| CT-Index: | |

**SMA Draindown**

| Temperature[2] (°C) | Draindown (%) | | |
|---|---|---|---|
| | Test 1 | Test 2 | Average |
| | | | |
| | | | |

**AC Volumetrics**

| | |
|---|---|
| Pbr: | |
| Pbe: | |
| Pba: | |
| Dust/Binder (DP): | |

**Gmm Dryback Correction Factor (if needed)**

| | |
|---|---|
| Gmm Dryback Correcction Factor: | |

**Alternative AC Sources**

| Alternative AC Source | AC Type | Gb | TSR[4] | # of Gyr.(N) | Additive[5] | Amt. Additive |
|---|---|---|---|---|---|---|
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

**Trial Binder (AC%) Data**

| Trial | Total %AC | % Added AC | Gmm | Gmb | % Air Voids | % VMA | %VFB/VFA |
|---|---|---|---|---|---|---|---|
| Trial 1 | | | | | | | |
| Trial 2 | | | | | | | |
| Trial 3 | | | | | | | |
| Trial 4 | | | | | | | |
| OPT. @ 4.0% Va | | | | | | | |
| OPT. @ 3.0% Va | | | | | | | |

**Comments:**

[1] For the Mix PG and Mix Binder Designation, use the mixture's resultant PG. This will typically match the bid item, but may exceed the PG in the bid item. (i.e.: resultant PG is 58-28 due to blend using 52-34 virgin AC + RAP).

[2] Use the anticipated plant production temperature. The second value is calculated automatically by adding 15° to the plant temperature.

[3] Additive used in initial design. Additional addtives may be added in the comments section or under Alternative AC Sources.

[4] TSR values are required when a change in source is from a modified AC to an unmodified AC or per WTP H-001.

[5] Additives for Alternative AC Sources can be submitted using the Request for JMF Change Form.

# SMA testing with Core Lok

- Bag Sizes MOTP and AASHTO References

# AASHTO T 331-23

5.4. *Plastic Bags*—The two most commonly used sizes of bags are designated as small and large size bags. The small bags shall have a minimum opening of 241 mm (9.50 in.) and a maximum opening of 267 mm (10.50 in.) with a mass of less than 35 g. The large bags shall have a minimum opening of 368 mm (14.50 in.) and a maximum opening of 394 mm (15.5 in.) with a mass of 35 g or more. The bags shall be made of a plastic material that will not adhere to asphalt film and shall be puncture-resistant, capable of withstanding sample temperatures of up to 70°C (158°F), impermeable to water, and contain no air channels for evacuation of air from the bag. The bags shall have a minimum thickness of 0.127 mm (0.005 in.) and a maximum thickness of 0.178 mm (0.007 in.). The manufacturer shall provide the bag correction factor (apparent specific gravity) of the bags (usually located in the operator's manual). See the manufacturer's recommendations to ensure proper handling of bags.

# 2026 MOTP



**WTM T331**
Effective with November 2025 Letting
Revised Date: 06/27/2025

Follow AASHTO T331 ***Standard Method of Test for Bulk Specific Gravity (Gmb) and Density of Compacted Asphalt Mixtures Using Automatic Vacuum Sealing Method*** with the following modifications:

| AASHTO T331-23 Section | WisDOT Modification: |
|---|---|
| 1.2 | *Replace Section 1.2 with the following:*<br>This method should be used with SMA and samples that contain open or interconnecting voids and/or absorb more than 2.0 percent of water by volume, as determined by WTM T166. |
| 2.1 | *Remove the following reference:*<br>AASHTO T275, Bulk Specific Gravity (Gmb) of Compacted Asphalt Mixtures Using Paraffin-Coated Specimens<br>*Replace the AASHTO R79, T166, and T312 references with the following WisDOT Modified versions:*<br>WTM R79 – Vacuum Drying Compacted Asphalt Specimens<br>WTM T166 – Bulk Mix Gravity (Gmb)<br>WTM T312 – Superpave Gyratory Compactor |
| 3.1.2 | *Replace Section 3.1.2 with the following:*<br>*Constant mass* – specimens are considered constant mass when the specimen achieves the *dry specimen condition* as defined in WTM R79. |
| 4.3 | *Replace Section 4.3 with the following:*<br>Specimens shall be taken from pavements according to WTM R67. |
| 6.1 | *Replace Section 6.1 with the following:*<br>*Initial Mass of Specimen in Air* –Vacuum-dry the specimens according to WTM R79. Recently compacted laboratory samples that have not been exposed to moisture do not require drying. Allow newly compacted SGC specimens to cool for by fan, lying upright on the flat face, for a minimum of one hour, after compaction time. Record the initial dry mass as *A*.<br>**Note 5** – Bulk specific gravity (Gmb) determined by this method may be lower, and air voids higher, than the results obtained by WTM T166. The differences may be more pronounced for coarse and absorptive mixtures. Users of this test method are cautioned to evaluate any alteration in asphalt content or aggregate gradation for mix designs with a positive performance history. If this procedure will be used for control or assurance testing, users are cautioned to follow this procedure during the laboratory mix design. |

# 2026 MOTP

- **No references to Bag Sizes in the MOTP**

**WTM T331**

Effective with November 2025 Letting
Revised Date: 06/27/2025

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# References to Bag sizes are in the AASHTO Standard

5.4. *Plastic Bags*—The two most commonly used sizes of bags are designated as small and large size bags. The small bags shall have a minimum opening of 241 mm (9.50 in.) and a maximum opening of 267 mm (10.50 in.) with a mass of less than 35 g. The large bags shall have a minimum opening of 368 mm (14.50 in.) and a maximum opening of 394 mm (15.5 in.) with a mass of 35 g or more. The bags shall be made of a plastic material that will not adhere to asphalt film and shall be puncture-resistant, capable of withstanding sample temperatures of up to 70°C (158°F), impermeable to water, and contain no air channels for evacuation of air from the bag. The bags shall have a minimum thickness of 0.127 mm (0.005 in.) and a maximum thickness of 0.178 mm (0.007 in.). The manufacturer shall provide the bag correction factor (apparent specific gravity) of the bags (usually located in the operator's manual). See the manufacturer's recommendations to ensure proper handling of bags.

- New Paver Screeds
  - SDX Cat screed
    - Higher density, less consolidation after the screed
    - Better ride
    - Open surface?

# Asphalt Analyzers

- Regulations Update
- Chemical Solvent Update

Casey Wierzchowski, PE

# Asphalt Analyzers

## Regulations - Where We Started

- TriChloroEthylene (TCE) and DiChloroEthylene (DCE) aka Methylene Chloride
- TCE  BTS Lab
  - Exposure Control Plan (ECP) 12/18/2025
  - Workplace Chemical Protection Plan (WCPP) – 09/15/2025
  - Phase out (Automated Extractors) 12/18/2034

- DCE  Region Labs
  - ECP 08/01/2025
  - WCPP 05/25/2025
  - Phase Out 04/28/2026

# Asphalt Analyzers

- Regulations Update (DCE)

- EPA is amending 40 CFR 751.109 to extend the WCPP compliance dates for non-Federally owned or operated industrial or commercial laboratories by an additional 18 months. This amendment aligns the compliance dates for non-Federally owned or operated industrial or commercial laboratories with the compliance dates established in the 2024 risk management rule for Federal agencies and their contractors (Ref. 2). Specifically, this final rule extends three compliance dates for non-Federally owned or operated industrial or commercial laboratories. For initial monitoring, the compliance date is extended from May 5, 2025, to November 9, 2026. For establishing regulated areas and ensuring compliance with the Existing Chemical Exposure Limit (ECEL), the compliance date is extended from August 1, 2025, to February 8, 2027. For ensuring the methods of compliance with EPA's exposure limits and for developing and implementing an exposure control plan, the compliance date is extended from October 30, 2025, to May 10, 2027. While the focus of this action is to extend the compliance dates of the WCPP for non-Federal laboratories using methylene chloride, EPA will consider all information received during this rulemaking towards future TSCA section 6(a) rulemakings.

# Asphalt Analyzers

## Chemical Solvent Alternatives Update

- AeroTron-Infra
  - Highly effective for Automated Asphalt Extraction.
  - Non-flammable.
  - Not regulated for transport.
  - Not a Hazardous Air Pollutant (HAP).
  - Not regulated as a hazardous waste.
  - Direct replacement for DCM and TCE.

# Asphalt Analyzers

AeroTron - Infra –Comparison to TCE & DCM
Document 6211-3
Issue Date: 9-29-2025

AeroTron Infra
EXCLUSIVELY FOR INFRATEST AUTOMATED ASPHALT EXTRACTIONS

Automated Asphalt Extraction Solvent
for InfraTest-USA Automated Asphalt Extraction Analyzers

**Comparison to TCE & DCM***

| Physical Characteristics | AeroTron-Infra | TCE | DCM* |
|---|---|---|---|
| Acceptable for Automated Extractions | Yes | Yes | Yes |
| Non-Flammable | Yes | Yes | Yes |
| Cleaning Performance | Excellent | Excellent | Excellent |
| Boiling Point | 116°F | 188°F | 160°F |
| Hydrolysis Reaction | None | Needs Inhibitors | Needs Inhibitors |
| Azeotropic Composition | Yes | Yes | Yes |
| Distillable | Yes | Yes | Yes |
| Kauri Butanol Value | 97 | 129 | 90 |
| Non-Volatile Residue | < 10 ppm | < 10 ppm | < 10 ppm |

| Regulatory Profile | AeroTron-Infra | TCE | DCM* |
|---|---|---|---|
| Hazardous Air Pollutant | No | Yes | Yes |
| Workplace Exposure | 200 ppm - 8 hr TWA Manufacturer's overall workplace exposure guideline (see SDS) | USEPA ECEL: 0.2 ppm - 8-hr TWA | OSHA PEL: 25 ppm 8-hr TWA |
| NESHAP Regulated | Not Regulated | Regulated | Regulated |
| Department of Transportation | Not Regulated | Regulated | Regulated |
| VOC (Volatile Organic Compound) | Yes | Yes | Yes |

*DCM also known as Methylene Chloride



- Will Need Software Update to Analyzer.
- Lower Boiling Point.
- Costs More.
- Not Considered Hazardous Waste.

- Evaluating to see if PG grading can be performed on recovered binders.
- Can use in InfraTest TCE and DCE machines, however there is a software update and changes in temperatures that need to occur.
- Currently Being Evaluated at S.T.A.T.E. Testing Laboratory.
- Will Be Evaluated Fall/Winter 2025/2026 Using BTS Analyzer and (#) Regional Laboratories.

# HMA Materials Research

We have invested extensively and will continue to do so

WisDOT Research

- External research
  - CAPRI Through TPF-5(465) HWTT CRD and IDEAL-RT
  - WHRP 24-01 High Traffic Asphalt Mixtures
  - WHRP 25-01 Investigation of Reflective Cracking
  - WHRP 26-01 Hamburg Wheel Track Test for Rutting Resistance
  - WHRP 27-01 IA Analysis
- Internal research
  - Materials Management Section (MMS) 24-52 Evaluation of Effectiveness of IDEAL-RT/HT IDT Test for the Evaluation of Rutting Resistance of Asphalt Mixtures
  - MMS 26-50 Use of FTIR Analysis to Verify Chemical Composition of Asphalt Binder

**Casey Wierzchowski, PE**

# External Research

## WisDOT Directed Research through CAPRI

## TPF-5(465) Using Hamburg Wheel Tracking Test (HWTT) Critical Rut Depth (CRD) and IDEAL-RT for Rutting Evaluation of Asphalt Mixtures in Wisconsin

- The evaluation of Wisconsin asphalt mixtures for rutting resistance using the CRD parameter.
- The validation of CRD parameter by running the HWTT in both wet and dry conditions.
- The assessment of correlation between CRD and IDEAL-RT test results.
- If necessary, proposing new thresholds for the CRD for the dense graded and stone mastic asphalt (SMA) mixes.
- Propose threshold for IDEAL-RT for the acceptance of asphalt mixtures during the production stage.

# External Research

## WisDOT Directed Research through WHRP

## WHRP 24-01 High Traffic Asphalt Mixtures

Research Goals:

- Summarize existing mix design requirements for high traffic (HT) mixtures in regions with similar climates ("Wet-Freeze") and aggregate resources to Wisconsin. Identify potential areas of improvement.
- Benchmark existing WisDOT HT mixture designs using volumetric and performance testing; proposed testing must include consideration of prior and ongoing WHRP HMA performance testing research.
- Propose modifications to existing HT mixture designs based on available data, benchmarking, and testing, and determine whether improvements to constructability and performance can be achieved using the proposed mix design procedure changes

# External Research

## WisDOT Directed Research through WHRP

## WHRP 25-01 Investigation of Reflective Cracking

- Reflective cracking of overlays is a significant challenge for WisDOT's pavement maintenance and rehabilitation budgets. Although reflective cracking in overlays is believed to be unavoidable, the mix design selected for the overlay can significantly affect the rate of reflective cracking propagation and deterioration.
- The primary objective of this project is to determine mixture performance and mix design requirements following BMD "Approach C" to increase the resistance of asphalt overlays to reflective cracking in Wisconsin.
- Identify process-driven methods to improve asphalt overlay performance for consideration by WisDOT in future WHRP studies or as pilot projects.

# External Research

## WisDOT Directed Research through WHRP

## Evaluation of Hamburg Wheel Tracking Test (HWTT) for Rutting Resistance Assessment FFY2026

The research will:

- Determine if the HWT test accurately represents rutting and stripping behaviors of fine-graded asphaltic pavement design mixtures.
- Propose and develop a representative rutting test that allows WisDOT to retain the benefits of fine-graded mixes while supporting the state's goal of fully implementing balanced mix design concepts.

# Internal Research

## MMS 24-52 Evaluation of Effectiveness of IDEAL-RT/HT IDT Test for the Evaluation of Rutting Resistance of Asphalt Mixtures

- MMS 22-53
- Evaluate the moisture damage resistance of asphalt mixtures at the design and production stages
- Research funding was used to equip WisDOT's central laboratory with an indirect tensile test (IDT) fixture for the measurement of TSR.

- MMS 24-52
- Addition of performing IDEAL-RT in the BTS BMD Laboratory
- Adding Equipment to the Southwest Region Lab in Madison to evaluate implementation of equipment and testing procedures while adding an addition source of testing data

# Internal Research

## MMS 26-50 Use of Fourier-transform infrared (FTIR) Analysis to Verify Chemical Composition of Asphalt Binder

- Establishing FTIR fingerprints of well-characterized binders for comparison with supplied binders, ensuring consistency and quality control across samples.
- Conducting comprehensive asphalt binder characterization in cases where a supplied binder raises concerns, allowing for detailed analysis and verification.
- Assessing the chemical composition to identify inconsistencies, evaluate aging effects, detect impurities, and examine the presence of polymer additives.
- Creating a foundation of FTIR data to use in additional research projects.
- Conducting chemical analyses immediately upon receipt of samples.

# Balanced Mix Design (BMD)

## An Update on WisDOT's Current Practice and Future Plans

Casey Wierzchowski, PE

# Balanced Mix Design (BMD) Approaches

- **Approach A: Volumetric Design with Performance Verification**
  - Starts with an agency approved mix design
  - The mix design is tested with selected mixture rutting and cracking tests
  - If the mix design failed, the entire mix design is repeated until all the volumetric and performance test criteria are satisfied
- **Approach B: Volumetric Design with Performance Optimization**
  - Similar to approach A, except for
  - Testing the performance at OBC and two or more additional binder contents of ± 0.3 to 0.5%
  - Selecting a binder content that satisfies the performance criteria
- **Approach C: Performance-Modified Volumetric Design**
  - Similar to approach A, except for
  - Adjusting the binder content or other mix component properties such as aggregates, binders, recycled materials, and additives.
  - Making sure that certain volumetric properties are in compliance with agency's relaxed requirements
- **Approach D: Performance Design**
  - An existing agency-approved mix design is used
  - The mix design is tested with selected mixture rutting and cracking tests at three or more binder contents at intervals of 0.3 to 0.5 %
  - A binder content that satisfies both the rutting and cracking criteria is selected as the OBC

# Reimagining BMD What's Different?

**Approaches A–D:** Refer to the **design methodology** and how mechanical tests are integrated into or guides the mix design process.

**Tiers 1–3:** Refer to a mixture **specification level** and how much flexibility is allowed in constituents and volumetric properties versus relying on mechanical tests.

# Reimagining BMD
# The Tiers

| Tier Level | Definition |
|---|---|
| Tier I | **Minimal relaxation** from existing specifications, limited to one or more volumetric properties associated with the targeted performance characteristic. No changes are required to related constituent material requirements. Applicable when early or limited performance data supports minor specification adjustments. |
| Tier II | **Moderate relaxation** and/or removal of specification requirements, involving at least one constituent and one volumetric property, with a total of three or more changes. All changes pertain only to properties tied to the targeted performance characteristic. Applicable when strong laboratory and field performance data support expanded flexibility. |
| Tier III | **Maximum reliance** on mechanical testing, retaining no more than two specification requirements (constituent and/or volumetric) related to the performance characteristic. Applicable when the mechanical test has undergone extensive filed validation, allowing performance-based control with minimal prescriptive requirements. |

North-Central Asphalt User/Producer Group September 11th, 2025

# Acknowledgments

## BMD IWG

BMD IMPLEMENTATION WORKING GROUP

https://www.asphaltpavement.org/expertise/engineering/resources/bmd-resource-guide/bmd-iwg

Members of the:

- Asphalt industry (producers, material suppliers, and associations).
- Agencies (DOTs, Counties, or Public Works Departments).
- Academia.
- Testing equipment suppliers

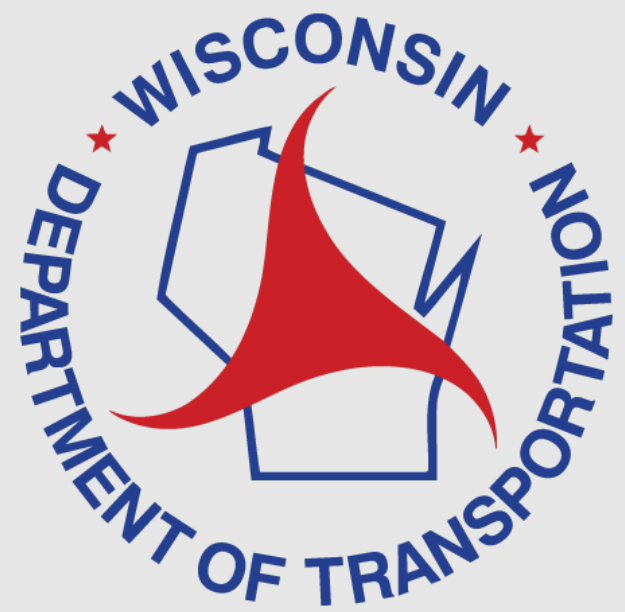
North-Central Asphalt User/Producer Group September 11th, 2025

# Tech Team

- **Team Purpose:** The HMA Technical Committee meetings are held to:
  - 1. Routinely meet and discuss issues pertaining to the materials and construction of quality HMA pavements.
  - 2. Address any issues and concerns with a perspective of technical expertise.
  - 3. Seek solutions that enhance pavement performance combined with economic efficiencies. The HMA Tech Team continuously evaluates new ideas, establishes new standards and accepts challenges to raise the level of product performance.
- Tech Team Specification Subcommittee 12/16/2025 10:00am-12:00pm
  - Potential Topics Could Include:

    PWL for SMA, Small Quantity Risk Assessment, SMA Small Quantities, What Really Happened at The Mos Eisley Cantina

**Casey Wierzchowski, PE**




Any questions or comments?

**Thank You!**