



Materials sampling and testing methods and documentation procedures prescribed in chapter 8 of the CMM are mobilized into the contract per [standard spec 106.3.4.1](#) and [standard spec 106.3.4.3.1](#).

Asphalt material sampling and testing methods as prescribed in CMM 8.66 are mobilized into the contract per [standard spec 301.2.3](#) and [standard spec 460](#).

Section revised for asphalt binder content testing, AASHTO T305 draindown testing, air void regression; 3% asphalt binder content, selected mixes are subject to performance-based testing, air void regression specs

8-66.1 ASPHALTIC MIXTURE DESIGN

Provide an Asphaltic Mixture Design Job Mix Formula (JMF) report representing the materials intended for use along with their proportions for producing the final product. These procedures infer laboratory mixed and compacted specimens unless designated otherwise.

Accountability for JMF Mix Design Reports is to be with Highway Technician Certification Program (HTCP) certified personnel and comply with the materials and mix design requirements of [standard spec 460](#).

If a contractor uses a consulting laboratory to supply a mix design, the Contractor must authorize in writing that the consultant acts as the contractor's agent during the mix design approval process.

During the mix design submittal process, WisDOT will only accept two (2) passing designs per each nominal maximum aggregate size or one (1) mix design per combined bid item (whichever is greater), per project. (During construction any approved mix design may be used).

When a mix design is to be submitted using Atwood's System a current WisDOT project is required.

The following default WisDOT project number shall be used **0250-11-11** on the 249 submittal form when a current WisDOT project number is not available at time of design. An example would be a non-DOT project requiring a DOT approved mix design.

Any mix design assigned a current 250 number and a one point verification will retain its original 250 number when added to the approved list,

Any mix design that had been issued a 250 number "not using the 249 form" may contact the Bureau of Technical Services (BTS) for instruction on how to obtain a 250 number in the current calendar year.

8-66.1.1 Acronyms and Definitions

Interpret materials related acronyms and definitions in accordance with [standard spec 450.2.1](#).

8-66.2 Laboratory Standard Method of Asphaltic Mix Design (previously called WisDOT Test Method 1559)

8-66.2.1 Description

This method is used to determine the optimum asphalt binder content for virgin asphaltic mixtures and asphaltic mixtures containing recycled asphaltic materials (RAM). This method also defines the submittal requirements pertaining to mix design reports and materials, as well as any field changes affecting mix design reports.

8-66.2.1.1 General

Required test procedures for aggregate and hot mix asphalt (HMA) are shown below in [Table 1](#) and [Table 2](#).

Table 1 Required Aggregate Test Procedures

AGGREGATE TEST	TEST PROCEDURE
Materials Finer than No. 200 (0.75mm)	AASHTO T 11
Sieve Analysis of Aggregates	AASHTO T 27
Mechanical Analysis of Extracted Aggregate	AASHTO T 30
Sieve Analysis of Mineral Filler	AASHTO T 37
Liquid Limit of Soils (from source aggregate quality report #225 or #162)	AASHTO T 89
Plastic Limit of Soils (from source aggregate quality report #225 or #162)	AASHTO T 90
Los Angeles Abrasion of Coarse Aggregate (from #225 report)	AASHTO T 96
Specific Gravity and Absorption of Fine Aggregate	AASHTO T 84
Specific Gravity and Absorption of Coarse Aggregate	AASHTO T 85
Flat and Elongated Particles in Coarse Aggregates	ASTM D4791
Soundness of Aggregate (from #225 report)	AASHTO T 104
Freeze-Thaw (from #225 report)	AASHTO T 103
Fractured Faces (CAA)	ASTM D5821
Uncompacted Voids Content of Fine Aggregates (FAA)	AASHTO T 304
Sand Equivalency (Plastic Fines)	AASHTO T 176

Note: The majority of test result parameters are referenced in Table 460-1 in [standard spec 460.2.2.3](#) or Table 460-2 in [standard spec 460.2.7](#)

Table 2 Required HMA Test Procedures

HMA TEST	TEST PROCEDURE
Practice for Superpave Volumetric Design for HMA	AASHTO R35
Specification for Superpave Volumetric Mix Design	AASHTO M323
Standard Practice for Mixture Conditioning HMA	AASHTO R30
Standard Method for Preparing and Determining the Density of HMA	AASHTO T 312
Specimens by Means of the SHRP Gyrotory Compactor Bulk Specific Gravity of Compacted Bituminous Mixtures	AASHTO 166
Using Saturated Surface-Dry Specimens Maximum Specific Gravity of Bituminous Paving Mixtures	AASHTO 209
% Air Voids in Compacted Dense and Open Bituminous Paving Mixtures	AASHTO 269
Resistance of Compacted Bituminous Mixture to Moisture	ASTM D4867
Determination of Draindown for Uncompacted Asphalt Mixtures	AASHTO T305
WisDOT Standard Specifications for Asphaltic Concrete Pavement	standard spec 460
Quantitative Extraction of Asphalt Binder from Hot Mix Asphalt (HMA)*	AASHTO T164
Asphalt Content by Ignition Oven*	AASHTO T308

Note: * these are not required as part of the mix design process

8-66.2.2 Summary of the Practice

1. Select aggregate components and the asphalt binder to be used, and determine the required properties defining those materials.
2. Design an aggregate structure (or multiple trial aggregate structures). Determine aggregate component blend percentages.
3. Determine trial asphalt binder contents (estimated by experience or by calculation based on aggregate properties of trial blends).
 - Compact gyratory specimens using a minimum of **3 times, preferably 4**, asphalt binder contents (0.5% increments) and covering a range to include the estimated optimum design binder content. Use Ndes for

compaction effort.

- All new mix design need at least one point that is a minimum of 0.5% below 3.0% Air Voids ($\leq 2.5\%$ Va) and one point that is at least 0.5% above 4.0% Air Voids ($\geq 4.5\%$ Va)
 - Compare trial binder content results. Select an optimum design binder content (by either graphing or interpolating the trial data results) meeting requirements as stated in [standard spec 460](#).
4. Evaluate additional properties at the selected optimum design binder content.
- Moisture Susceptibility (using [ASTM D4867](#)).
 - Validate compliance of $\%G_{mm}$ at N_{max} and N_{ini} by compacting 2 specimens at the design binder content to N_{max} gyrations.
 - For SMA designs, AASHTO T305 must be followed and testing conducted at two temperatures. The two temperatures should be the anticipated production temperature and $+15^{\circ}\text{C}$ about the anticipated production temperature. Mix must be prepared at optimum AC%. Report the average percent Draindown (average percent of the mixture that drained) at each of the test temperatures.
 - Draindown value at anticipated production temperature and at 15°C above anticipated production temperature, average of two (2) values at each temperature is required.
5. Complete a mix design report identifying materials used and summarizing volumetric properties in meeting required specifications in [CMM 8-66.2.4](#).
6. Submit the mix design report, and representative materials when requested or required, to the department for review per [CMM 8-66.2.5](#).

Additional guidance for materials selection and component composition involved in the mix design process can be referenced in, but not limited to, the following:

- Superpave Mix Design Manual SP-2 (Asphalt Institute)
- Mix Design Methods for Asphalt Concrete MS-2 (Asphalt Institute)
- NCHRP 9-33 (A Mix Design Manual for Hot Mix Asphalt)
- NCHRP Report 673 (A Manual for Design of Hot Mix Asphalt with Commentary)

8-66.2.3 Materials and Test Procedures: Additional Guidance

8-66.2.3.1 Aggregates

Refer also to [CMM 8-60](#) and [standard spec 1.06.3.4.2.2](#)

Test the aggregate source material for quality properties (LA wear, soundness, freeze-thaw, etc.) in accordance with the current department policy and required frequency. Count the current construction season as one year of aggregate quality eligibility.

The mix designer, using the previously listed test methods determines the aggregate properties with the following exceptions or comments:

- Fine aggregate angularity (FAA) is determined using Method "A" (AASHTO T 304) on each individual component with more than 10% passing #8 sieve (2.36mm) and on the current JMF blend.
- A specific gravity must be completed on each P-#8 component following AASHTO T84. The extracted aggregate from RAM shall be obtained through the extraction process by either of the following:
 - Ignition oven
 - Chemical extraction
- Flat and elongated particles are determined using particles retained on the #4 sieve (4.75mm) and larger. The determination of the F&E percentage is based on weight; however, the sample size is intended to be by count (200 pieces, minimum).

8-66.2.3.2 Asphaltic Binder Material

Select an asphalt binder meeting the contract requirements and having been defined or graded according to AASHTO M320. (refer to [CMM 8-65](#))

The asphalt binder source and grade indicated on the JMF Mix Design report must represent the material used during the mix design process in determining the optimum asphalt content. If recycled asphaltic materials are part of the mix design additionally refer to [standard spec 460.2.6](#)

If the following criteria are met, no additional testing is needed to alter the binder PG grade from the original design. However if any of the following criteria are not met by the original design, a laboratory or field produced

verification check (“one point” at current AC %, current JMF gradation: including all current approved JMF changes to date) must be performed and reported/submitted to validate the individual property (ies) not met, prior to use:

<u>Property</u>	<u>JMF Criteria</u>
TSR*	> 77%**
%G _{mm} at N _{ini}	<88.5 (for HT mixes)
%G _{mm} at N _{max}	< 97.5

* Compacted using optimum AC %, at 7.0% (+/- 1.0%) air voids, using current JMF blend, with all current approved JMF changes.

- If the resultant “laboratory or field produced verification check (one-point)” indicates a need to adjust the mix design targets or component combinations to meet specifications, then additional testing and separate design submittal may be required by the engineer.

Changes in the asphalt binder source during production are by notification to the engineer and to be documented showing approved new supplier.

<http://wisconsinidot.gov/Pages/doing-bus/eng-consultants/cnslt-rsrcs/tools/appr-prod/default.aspx>

8-66.2.3.3 Preparation of Mixtures

Combine the aggregates and asphaltic binder noting the following exceptions:

- The requirement for using trial aggregate blends as prescribed in AASHTO R35 is optional.
- Compaction effort gyrations are set by WisDOT standard specs and may deviate from AASHTO R35. Additionally refer to [standard spec 460.2](#)

8-66.2.3.4 Compaction of Specimens

Produce the required compacted specimens (minimum of 2 specimens for each asphalt binder content) using AASHTO T 312 and AASHTO R30.

For aggregate JMF blends with moisture absorption greater than or equal to 2.0% a 4-hour cure time is to be used and indicated on the JMF mix design report. Report the actual absorption value on the report and additionally state the cure time within the report or comment section.

8-66.2.3.5 Determination of the specific gravity of SGC compacted asphaltic (G_{mb})

Determine specimen Bulk Specific Gravity (G_{mb}), using AASHTO T 166, Method A. Report G_{mb} value to three decimal places (0.001).

8-66.2.3.6 Determination of the mixture maximum specific gravity (G_{mm})

Determine Maximum Specific Gravity, (G_{mm}), using AASHTO T 209. For aggregate JMF blends with moisture absorption greater than or equal to 2.0%, additionally use the supplemental procedure for mixtures containing porous aggregates not completely coated (dry back procedure). This data is to be listed on the JMF mix design report.

A minimum of two tests must be run, one each at two different asphalt trial binder contents. Calculate the G_{se} for each G_{mm} test run (to three decimal places, 0.001) and average the results. Use this calculated average G_{se} to determine all G_{mm} values for the trial data. Report any G_{mm} value to three decimal places (0.001).

8-66.2.4 Report

8-66.2.4.1 General

The mix designer/laboratory creates a summary report to be submitted electronically into Atwood’s Systems using the 249 form for review, along with an electronic copy (pdf of 249 form and mix design report) to BTS and the regional office. This summary must include trial data used to determine the design optimum binder content.

8-66.2.4.2 Report Items

The following is a breakdown of the minimal information needed to be listed on the mix design report. An example report can be found at the end of this section.

Summary of Aggregate Source/Component and RAM Data:

- Source name (as noted on 225 report), pit or quarry designation (P or Q), and 225 number, for each component, using the following format (225-xxxx-xxxx).
- Component Gradations: gradations for each aggregate and the final blend must be shown as the % passing (the nearest 0.1) for the 1 ½" (37.5mm), 1" (25.0mm), ¾" (19.0mm), ½" (12.5mm), 3/8" (9.5mm), #4 (4.75mm), #8 (2.36mm), #16 (1.18mm), #30 (0.60mm), #50 (0.30mm), #100 (0.150mm), and #200 (0.075mm) sieves.
- The percent of each aggregate and/or RAM component as compared to the total aggregate.
- LA Wear loss, % (include department test number or listed values).
- Soundness loss, % (include department test number or listed values).
- Freeze-thaw, % (include department test number or listed values, refer [standard spec 106.3.4.2.2](#)).
- Aggregate Bulk specific gravity (G_{sb}).
 - For mixtures containing RAM extracted gradation data, G_{sb} and percent extracted asphalt content is required.
- Flat and elongated (Method B), %.
- Coarse fracture/crush count (1-face and 2-face), %.
- Fine aggregate angularity (Method A) for fine aggregate only. i.e.: Sands (Natural, Manufactured) and P#8 of RAM components.
- Moisture absorption %.

Aggregate Blend Data:

- Flat and elongated (Method B), %.
- Coarse fracture/crush count, %.
- Sand equivalency.
- Fine aggregate angularity.
- Moisture absorption %.
- Bulk specific gravity (G_{sb}).
- Effective specific gravity (G_{se}).

Asphaltic Binder:

- Binder source (supplier).
- Binder performance grade and designation level (S, H, V, or E).
- Binder specific gravity @ 77 / 77F (25 / 25C).
- **Laboratory Mixing- and Compaction - Temperatures (based on AASHTO T 312) for laboratory produced mixture evaluation, see [CMM 8.36.6. 6\(2\)](#).**
- Type of Additive
- Amount of Additive

Mixture Properties (using trial asphalt binder contents)

- Binder content, % (P_b).
- Air Voids, % (V_a).
- Maximum specific gravity (G_{mm}).
- Bulk specific gravity of the compacted mixture (G_{mb}).
- VMA (voids of the mineral aggregate), %.
- VFB (voids filled with binder), %.

Mixture Properties (design "optimum" asphalt binder content):

- Binder content, % (P_b);.
- Maximum specific gravity (G_{mm}).
- Bulk specific gravity (G_{mb}).
- Air voids, % (V_a).

- VMA (voids of the mineral aggregate), %.
- VFB (voids filled with binder), %.
- DP (dust/binder proportion), % (using effective binder content, P_{be} , for calculation).
- Gyrotory compaction effort (for N_{ini} , N_{des} and N_{max}).
- %Gmm (for N_{ini} , N_{des} and N_{max}).
- TSR (tensile strength ratio), %.
- TSR Compaction Effort ($N = "x"$).
- Gmm Dryback Correction Factor, % (if applicable).

Mixture Properties (3.0% "Air-Void Regression" asphalt binder content):

- Binder content, % (P_b);
- Maximum specific gravity (G_{mm}).
- Bulk specific gravity (G_{mb}).
- Air voids, % (V_a).
- VMA (voids of the mineral aggregate), %.
- VFB (voids filled with binder), %.

For Recycled Asphaltic Pavement Mixtures also list:

- Added binder content, %.
- Total binder content, %.
- Extracted asphalt binder % (of recycled components)
- Percent Binder Replacement (P_{br})

Miscellaneous:

- Name of WisDOT - HTCP Certified HMA technician (at level designated for mix design) identifying responsibility for mix design data.
- Name of design laboratory facility, its address and phone number (contact location).
- Design date (representing completion of the mix design work).
- Design ID (unique number or name).
- Traffic level classification (e.g. LT, MT, HT).
- Asphalt mixture gradation (NMAS) (e.g., Gradation 1, 2, 3, 4, 5 or 6 representing 37.5mm to 4.75mm, respectively).
- Report draindown results (at two temperatures)

8-66.2.5 Report Submittal and Department Review

8-66.2.5.1 General

Mix design summary reports, and either individual or batches of blended aggregates (if required or requested), are to be submitted to WisDOT - Bureau of Technical Services (BTS) prior to paving, using one of the following two methods: Comparison Level or Express Level.

Each mix designer will be subject to a minimum of one comparison level submittal per year.

In addition mixes meeting the following criteria should have material submitted to BTS: Design values for VMA (+0.5%), FAA (+1.0%), or TSR are within +5% of the lower limit requirements in table 460-1 & 2 of the standard specifications may be selected for comparison submittal. The 10 day limit for comparison submittal does not apply.

In addition to the above requirements for comparison mix design submittal, BTS requires any BTS-selected mixes be submitted for performance-based testing:

Note: If a mix design is selected for both comparison and performance-based testing, only one batch of 4-6800 gram specimens and 3-quarts of asphalt binder are required to be submitted to BTS, this does not preclude TSR specimens (8), which must still be prepared and submitted.

The specific mix subject to this requirements will be determined by BTS and communicated to each mix designer. Designation of a design laboratory, or a certified mix designer to a specific submittal level is

determined by the BTS. BTS will authorize and direct movement between submittal levels.

Submittals received after 4pm (Mon-Fri) will be acknowledged as arriving the following work day.

Each design must be submitted using WisDOT form 249, WisDOT Mix Design Standard Data Detail ([Figure 3](#)) through WisDOT Material Reporting System (MRS). Contractor to provide electronic notification to BTS and the regional HMA Specialist when form 249 is submitted. A blank form 249 is available at:

<http://wisconsindot.gov/rdwy/worksheets/form249.xlsm>

Only one mix design per email notification will be accepted.

At BTS's discretion, any or all of the following testing may be performed:

Aggregates:

- Test the aggregate for compliance to [standard spec 460.2.7](#), Table 460-2:
 - Flat and elongated (Method B), %
 - Coarse fracture/crush count (1-face and 2-face), %
 - Sand equivalency
 - *Fine aggregate angularity (Method A)
 - Moisture absorption %
 - *Bulk specific gravity (Gsb)
- Note: * Gmb and Gmm need to meet tolerances in Table 3 of CMM 8-66, compared to results provided on original Mix Design submittal.

HMA:

Test the HMA for compliance to [standard spec 460.2.7](#), Tables 460-1 and 460-2.

- Note: *Gmb and Gmm need to meet tolerances in Table 3 of CMM 8-66, compared to results provided on original Mix Design submittal.

Table 3 Allowable Differences between Contractor and BTS Comparison Test Results

Test	Allowable Difference
Mixture bulk specific gravity (Gmb)	+/- 0.030
Mixture maximum specific gravity (Gmm)	+/- 0.020
Fine Aggregate Angularity (Method A), uncompact voids (%)	- 1
Aggregate Individual Bulk Specific Gravity (+No. 4 [+4.75mm]) (Dry)	+/- 0.025
Aggregate Individual Bulk Specific Gravity (-No. 4 [-4.75mm]) (Dry)	+/- 0.032

Note: Individual component aggregates may be tested; where upon adequate material shall be required for testing, communication between BTS and the mix designer shall take place beforehand before requesting materials.

If BTS's test results are less than the values in Table 460-2 for minimum TSR values, the mix may need to be redesigned and tested, also all future submittals using this source may require the submission of TSR samples for verification/acceptance testing until BTS is satisfied with the source. Communication with BTS is required and all testing is at the discretion of BTS.

8-66.2.5.2 Comparison Level Submittals

This process requires submittal of the mix design summary report and blended aggregates representing the mix design Job Mix Formula (JMF). Materials are to be submitted to the department a minimum of 10 working days prior to paving.

- Include 4 (four) – 6800g (15 lb) batches of the blended aggregate, representing the mix design JMF, (inclusive of any components containing Recycled Asphaltic Materials) and a minimum of three (3) quart cans of design PG binder.
- Or BTS may request individual aggregate/RAM samples for each component and a minimum of three (3) quart cans of the design PG binder in place of the composite aggregate samples.

If TSR's are requested, the contractor will supply 8 (eight) - compacted specimens to BTS. Compact specimens to

7.0 +/- 1.0%, air voids.

The following conditions shall indicate a need to follow this submittal procedure (communication with BTS is required):

1. Any design laboratory or certified asphalt mix designer submitting designs to the BTS for the first time (regardless of previous history for either).
2. Any design laboratory or certified asphalt mix designer having lacked submittals for a period of three consecutive construction seasons.
3. Any design laboratory or mix designer abusing the "express submittal" privilege (ex: multiple instances of incorrect or non-compliant data/information needing correction or formal amendment). Note: This condition will be identified and communicated when trending and then defined by notification from the BTS.

The Superpave Mix Design may be refused, or the review may be stopped, if any of the following situations occur (but not limited to):

- Evaluation of Superpave Mix Design results indicates a failing design.
- Incorrect or insufficient material is submitted.
- Incomplete documentation.
- Aggregate(s) do not meet physical requirements specified per Table 460-2
- The Contractor/Consultant requested combined gradation does not meet Table 460-1 Aggregate Gradation Master Range.
- No BTS office notification (of comparison level samples being sent to BTS).
- Invalid Aggregate Quality Number.
- Contractor/Consultant suspends interest in submitted material.
- Other unforeseen situations as deemed by BTS.

Subject to BTS workload and after the contractor/consultant efforts are made to resolve all discrepancies in the submittal, the ten (10) day review procedure will resume.

Transition from "comparison level" submittal requirements to "express submittals" will be by notification from BTS.

Results of the comparison review shall be compared. When tolerances are exceeded in Table 3 or if the results are less than the requirements in Table 460-1 & 2 of the Standard specifications a new mix design may need to be completed and submitted by the Contractor/Consultant.

8-66.2.5.3 Express Submittal

Design laboratories or certified designers may use this submittal procedure with authorization from BTS.

The design laboratory must submit the mix design summary report (electronically) to the department for review and provide a copy to the department's regional office a minimum of 4 working days prior to start of paving.

1. The department will review the mix design summary report and acknowledge specification compliance by the following 4th work day after submittal.

In the event that the submitted design does not meet specifications, or the individual contract requirements, the department will notify the mix designer and may elect to delay release of the review (potentially impacting paving); until such time that the specifications are met.

HTCP Certified mix designers requesting mix design comparison testing should follow the requirements for "Comparison Level" submittals and alert the Bureau of Technical Services Truax Center Laboratory of the request to have properties checked. Use of this submittal procedure, while authorized for Express Level, does not negate further use of Express Level submittals.

8-66.3 Mixture Design Life

All HMA mix designs shall have a life of 3-years from the date of the initial assigned WisDOT 250 number. Count the current construction season as one year of mix design life eligibility. Any mix design that will surpass the 3-year life will require a one-point verification using lab or field produced materials. One-point verifications this shall be performed on the current JMF blend (including all current approved JMF changes) and optimum AC% using Ndes gyrations. Results shall be submitted electronically to BTS - Truax for review along with the current mix design including any current approved JMF changes. Individual specific gravities shall not vary more than the allowable differences in table 4.

BTS will review the submitted data within 4 (four) working days and if compliant the mix shall then be placed on

the approved HMA Mix Design List for another 3-year cycle. BTS will review the results to verify they are not less than the requirements listed in Tables 460-1 & 2 of the Standard Specifications.

The percent binder replacement (Pbr) in section 460.2.5 shall also be verified and reported to show results are within allowable tolerances. Note: The tolerances in Table 4 shall be used to evaluate the one-point verification test results.

Previously approved mix designs not meeting the requirements of the Air Void Regression specification (i.e., having a point $\leq 3.0\%$ Air Voids), require an additional point be run at the next lower 0.5% AC increment. In this instance, mixes are to be entered into MRS using the 249 form and will be assigned a new 250#. The previously assigned 250# number associated with the mix (prior to conducting the next lower 0.5% AC increment) will become inactive.

Table 4 Allowable Differences for One-Point Verification Check Test Results

HMA	Allowable Difference
Air Voids (Va) %	+/- 0.5
Aggregates	Allowable Difference
Aggregate Individual Bulk Specific Gravity (+No. 4 [+4.75mm]) (Dry)	+/- 0.025
Aggregate Individual Bulk Specific Gravity (-No. 4 [-4.75mm]) (Dry)	+/- 0.032

A mix design shall carry over for subsequent construction seasons, with-in the 3-year design life, when all of the following are met:

1. Department specification changes have occurred, and the mix design still meets those specifications for any current contract.
2. Aggregate quality data is current per [standard spec 106.3.4.2.2.1](#). See department 162 and 225 reports for approved aggregate sources at:
<http://wisconsin.gov/Pages/doing-bus/eng-consultants/cnslt-rsrcs/tools/appr-prod/default.aspx>
3. Design aggregate component blend percentages will not be changed by more than 20% in any combination at any single point during production.
 - a) Note that any single component blend adjustment will result in a need to adjust additional components to balance the blend (e.g.: any component adjusted by 10% will also require an additional "other" 10% change between the remaining components, resulting in the maximum 20% referenced change). However, component blend changes are not accumulative so component blend changes back towards the original JMF will not be considered as exceeding the 20% maximum. The following example illustrates changes to proportions and how to assess blend changes:
 1. For example if the original proportions for the aggregates are: Agg1 = 25%, Agg2 = 25%, Agg3 = 45%, Agg4 = 5%. Then the initial component blend first changes by adjusting Agg1 to 35% and Agg2 to 15% resulting in a 20% change from the JMF. Then a second change had Agg1 moved back towards the original JMF to 30% and changed Agg2 to 20% resulting in a 10% net change from the original JMF. The second change does not get added to the first change of 20%. Each change is independently assessed against the original JMF, not added to other previous changes.
 - b) Blend changes indicating an excess of the maximum 20% away from the original JMF will not be considered the same mix design within the same season or any subsequent season. Continued use will require a new mix design or approval of the engineer (documenting the reason).

Any need for elimination or addition of new aggregate (inclusive of RAM) components will require a new mix design. Additives including a change in the dosage rates may require additional testing to insure compliance. Recognizing all current design JMF target changes with associated QMP data from the end of the previous construction season shall be required and must be noted "as such" prior to initial paving.

Current list of Approved Asphalt Mix Designs:

<http://wisconsin.gov/Pages/doing-bus/eng-consultants/cnslt-rsrcs/tools/appr-prod/default.aspx>

8-66.4 Amended JMF Reports and JMF Report Reviews

Previously submitted mix designs needing to be edited or updated will be re-submitted along with an explanation for the nature of the change (and any supporting data). Examples of these instances could be:

1. Typographical Errors
2. Addition of PG binders in order to comply with [CMM 8-66.2.3](#).

3. Mix Design Signatures (HTCP Accountability)

8-66.5 Non Traditional or Non-Standard Mixture Design Reports

Warm Mixed Asphalt (WMA): Laboratory work should be completed at additive supplier recommended mixing and compaction temperatures. These temperature ranges are to be listed on the JMF report and the mix design submittal 249.

For mix designs involving specialty products, components, or needing to meet a local special provision, identify in the comment section of the report or within the submittal correspondence.

8-66.6 Example Worksheets

Figure 1 JMF Mix Design

CRM W234 N798 Busse Road Waukesha, WI (262) 524-1731	REPORT OF SUPERPAVE VOLUMETRIC MIX DESIGN (AASHTO MP-2, PP-28, T312 & ASTM D 4867)	Issued Date: 7/18/2013 Amended Date: 7/18/2013										
Design Number: 503713 Plant: Portable Plant Mix Size: 3/4" (19mm)	Job: 3170-00-70 Mix Type: E-1 Design ESAL Range (mil): 0.3 to <1	Mix Temperature: 135-149°C										
Effort: NI: 7 Nd: 60 Nm: 75												
Binder Data: GRADE: PG 58-28 SOURCE: CRM Milwaukee Gb: 1.030 Pbr: 28												
AGGREGATE SOURCE DATA												
AGG	AGGREGATE	SOURCE	TEST#	LOCATION	Psb							
Agg #1	7/8" Chip	Honey Creek		S6 T3N R19E Racine County								
Agg #2	5/8" Chip	Bloomfield		S1 & S2 T1N R19E Walworth County								
Agg #3	3/8" Chip	Bloomfield		S1 & S2 T1N R19E Walworth County								
Agg #4	MFG'D Sand	Bloomfield		S1 & S2 T1N R19E Walworth County								
Agg #5	Natural Sand	Gander Mountain		S5 & S8 T46N R9E Mc Henry, IL								
Agg #6	DEG	40033		40033								
Agg #7	FRAP	40033		40033	3.68							
Agg #8	SAS	40033		40033	20.24							
AGGREGATE GRADATION												
%Blend	Agg#1	Agg #2	Agg #3	Agg #4	Agg #5	Agg #6	Agg #7	Agg #8	JMF	SPECIFICATIONS		
	10.0	12.0	13.0	20.0	20.5	0.5	21.0	3.0		MIN	MAX	
2 50.0 mm	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0		
1 1/2 37.5 mm	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0		
1 25.0 mm	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100	100
3/4 19.0 mm	88.1	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	98.8	90	100
1/2 12.5 mm	13.4	82.0	100.0	100.0	100.0	100.0	98.9	100.0	100.0	88.9		90
3/8 9.5 mm	6.6	19.0	96.3	100.0	100.0	100.0	94.8	99.7		79.4		
#4 4.75 mm	4.2	3.2	16.0	96.1	100.0	100.0	76.9	93.8		62.1		
#8 2.36 mm	3.8	2.6	4.2	68.1	86.0	100.0	58.5	87.9		47.9	23	49
#16 1.18 mm	2.7	2.3	3.7	42.6	62.5	100.0	43.5	68.8		34.1		
#30 0.6 mm	2.4	2.2	3.5	26.1	40.1	100.0	32.1	46.8		23.0		
#50 0.3 mm	2.4	2.1	3.3	11.3	13.8	100.0	20.1	38.1		11.9		
#100 0.15 mm	2.2	1.9	3.2	3.6	2.1	100.0	13.9	30.0		6.3		
#200 0.075 mm	1.9	1.8	2.8	2.3	0.5	100.0	10.9	26.0		4.9	2.0	8.0
FAA				44.0	40.8			43.7		43	40	
Gsb	2.689	2.691	2.659	2.651	2.653		2.683	2.213		2.652		
AGGREGATE DATA FOR BLENDED DESIGN JMF												
CRUSH 1F/2F: 84.4/72.6	Gsb:	2.652	Moist. Absorption:	1.4	L.A. WEAR:	ELONGATED:	1.0 (5/1)					
FAA: 43	Gac:	2.753	Dust Proportion:	1.1	Freeze-Thaw:							
SE: 96	Gse:	2.690	Soundness:									
VOLUMETRIC DATA												
Point	Added Pb	Total Pb	Gmm	Gmb	Va	VMA	VFB	Unit Weight	% Gmm Ni	% Gmm Nm	TSR	
A	2.8	4.2	2.519	2.358	6.4	14.8	56.8	2352				
B	3.3	4.7	2.501	2.387	4.6	14.2	67.6	2381				
C	3.8	5.2	2.482	2.410	2.9	13.9	79.1	2403				
JMF	3.5	4.9	2.493	2.393	4.0	14.2	71.8	2387	90.3	97.0	81.7	
Corr Factor:										TSR N =	26	
SPECIFICATION						>13.0	65-78			<90.5	<98.0	

Comments
 WisDOT Aggregate Test Number: 225-0030-2013 225-0070-2009 WisDOT Verification Number:
 Under production eliminate Deg., Gander Mountain Natural Sand to 21.0%.
 A change in binder grade is recognized without the need for additional mix design laboratory testing as defined in the current WisDOT 1559.



Michelle M. Colling

Wisconsin Certified Hot Mix Asphalt Technician

THE TEST DATA SHOWN ON THIS REPORT PERTAIN ONLY TO THE MATERIAL SUBMITTED FOR DESIGN.

Figure 2 Mix Design Submittal Form 249

WisDOT MIX DESIGN STANDARD DATA DETAIL

For dept. use only

WisDOT Project #	Design Lab or Company:	WisDOT Mix Design ID:
Mix Design ID:	*Mix Designer:	WisDOT Design Verification Date:
Mix Type:	Designer HTCP Cert ID#:	
NMAS:	Producer:	
Virgin Binder PG	Plant #/Location:	Design Amended Date:
Binder Designation	Design Date:	Last IMF Change Date:
Virgin Binder Gb		
Virgin Binder Source		

Primary AC Source/Type

Instructions: Cells that are light blue are data field for user to enter data all other cells are locked.

*Note: Type not signature block

AGGREGATE COMPONENT GRADATION DATA

	Agg 1	Agg 2	Agg 3	Agg 4	Agg 5	Agg 6	Agg 7	Agg 8	RAM 1	RAM 2	RAM 3	IMF BLEND
Blend %s (0.1)												0.0
Virgin Agg. Blend %'s (0.1)												0.0
Material Description												
Source ID/Name (needs to match 215 report)												
P or O or MF or Dual RAM phone ID)												
WisDOT Agg Test ID (if known)												
RAM Extracted % Binder												

Sieve (mm)	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:																								
CAA 1F (%)																								
CAA 2F (%)																								
FAA:																								
Moisture Abs. (%)																								
Thin/Elong. (%)																								

CAA 1F (%)	0.000
CAA 2F (%)	#DIV/0!
FAA:	#DIV/0!
Moisture Abs. (%)	0.0
Thin/Elong. (%)	0.0

IMF PROPERTIES AT OPTIMUM % BINDER

Laboratory	HMA	Warm Mix	SMA	Draindown (%)	*Temp. °C	*Temp. °F			*Temp. °C			*Temp. °F		
						1	2	Avg	1	2	Avg	1	2	Avg
Rec. Mix Temp (F)														
Compact Temp (F)														
*Type Additive														
*Amt. Additive														
* Additive used in initial but additional additives may be added in the compaction section.														

TRIAL AC DATA		Gmb		% Air Voids		% VMA		% VFE/VFA	
Trial 1	Trial 2	Gmb	% Air Voids	% VMA	% VFE/VFA	Trial 1	Trial 2	Trial 1	Trial 2

Total % Binder		Added % Binder		Gmb		% Air Voids		% VMA		% VFE/VFA	
Trial 1	Trial 2	Trial 1	Trial 2	Trial 1	Trial 2	Trial 1	Trial 2	Trial 1	Trial 2	Trial 1	Trial 2

Alternate AC Source		AC Type		GB		TSR (%)**		# of GRY.(N)		Additive*		Amt. Additive	

* Additive for alternate binder can be some using IMF form
 ** TSR values are required when a change in source is from a modified AC to a unmodified AC
 CMM 8.66 2.3.2

COMPACTION EFFORT/LEVELS - Primary Binder		Nini		Nides		Nimax	
# of Gyration (N)	% Comp at Optimum						

Comments