MaineDOT Policies and Procedures for HMA Sampling and Testing

February 6, 2025

MaineDOT Policy

RANDOM NUMBER POLICY

January 31, 2025

1. METHODS

Random numbers for use on MaineDOT projects must be generated each year by one of the following methods:

A. Using a computer program or spreadsheet designed specifically to generate random numbers or locations for material sampling
B. Using a handheld calculator with a random number generating function.
C. Manually, per ASTM D3665

2. UTILIZATION AND DOCUMENTATION

Random numbers are generated to determine the test location or sample tonnage (ton) in a stratified manner. Random numbers are to be applied to the sublot sizes outlined in the most current 401 Specification, for volumetric and density testing. An alternative method, such as testing by area using a stratified random station and offset process, may be utilized to determine random sampling locations if the Department and Contractor agree at the preconstruction or pre-pave meeting.

Immediately after the numbers have been generated, they shall be recorded in their entirety. This recordation shall include the numbers, date generated, method used, signature of the individual that generated the numbers, and the MaineDOT project number they have been generated for.

MaineDOT and the Contractor will have the random numbers to be used on the project generated prior to the pre-paving meeting every year. Both parties will have the random numbers generated and the Contractor shall present the quality control random numbers to the Resident, or his representative. The random numbers generated by MaineDOT for acceptance testing will be kept in a secure location acceptable to the Resident. At no time will the random numbers generated for acceptance testing be available to the Contractor prior to testing. Specific random numbers and locations may be viewed by the Contractor only after testing has been completed on material sampled from the random location.

Acceptance lots and sublots must be closed at the end of each year. If there is less than one-half of a sublot remaining at the end of production for the year, then it shall be combined with the previous sublot. If there is more than one-half sublot remaining at the end of production for the year, then it shall constitute the last sublot and shall be represented by test results.

3. **AVAILABILITY OF NUMBERS**

Upon completion of the item MaineDOT random numbers shall be supplied to the contractor in the same format QC random numbers were supplied to MaineDOT at the prepaving conference. Under no circumstances will MaineDOT Acceptance random numbers be supplied to the contractor prior to completion of the item.

MaineDOT Policy

APPROVAL OF AGGREGATE FOR USE IN ASPHALT MIXTURES

January 31, 2025

SPECIFICATION HMA MIX DESIGNS

The following sections shall apply to specification hot mix asphalt (HMA) that is covered by the Standard Specification 401 – Hot Mix Asphalt Pavement and Special Provision 403 – Hot Mix Asphalt Pavement.

1. HMA SUPPLIERS' AGGREGATE APPROVAL PROCESS

Aggregates for Use in HMA

The Department tests and approves aggregates for specification HMA on an annual basis. The aggregates shall be evaluated individually by company, source, and product. The HMA supplier shall only use aggregates that meet Section 703.07 of the Specification. The HMA Supplier shall submit requests for aggregate approval to the Assistant Pavement Materials Engineer, using the most recent version of the HMA Aggregate Submittal Form found on the website. New sources shall be communicated using the most recent version of the MaineDOT New Pit or Quarry Request Form.

The request shall be submitted by aggregate source and product for each supplier, with the following information provided:

- Individual stockpile identification information required in Section 105.8.6 of the Maine Standard Specifications (aggregate source, pit name, owner, location, etc.)
- Plant-locations where the aggregate will be used
- Individual aggregate product gradation
- Individual aggregate consensus quality test results (All applicable properties according to Table 1)
- Requested approved ESAL level

The HMA supplier shall submit samples to the Central Laboratory for each NEW aggregate source (excluding RAP). The Contractor shall submit six full 3.5 gallon buckets per coarse aggregate source product and four full 3.5 gallon buckets per fine aggregate source. If the aggregate source meets both coarse and fine gradation criteria submit six full 3.5 gallon buckets. The HMA supplier may elect to submit aggregate samples to the Freeport Laboratory but the official submittal date shall reflect the date the samples were received at the Central Laboratory. Transportation from the Freeport Lab to the Central Lab will be at MaineDOT's discretion. Each bucket shall be labelled (with painter's tape and marker) with the specific aggregate stockpile it represents that matches the name used on the submittal. The aggregate sample tags (only one per product) shall be submitted in an envelope or zip-lock bag along with the buckets (not inside the buckets). The aggregate samples must be delivered within normal lab working hours (6am to

4pm) so that the Laboratory may receive them. Aggregate qualification samples for the next construction season should not be delivered to the MaineDOT lab prior to Nov 1st.

Aggregate approval will not have an expiration timeline but must have been sampled and tested by the Department within the last year to be eligible for use in a mix design. Once the aggregate source has been approved by the Department the assigned book value will remain the value of record until the contractor requests the Department obtain a sample of the material due to documented material or process changes or there is a failure during aggregate production monitoring by the Department as stated in Section D below.

Table 1: Required properties for each aggregate type

Aggregate Type	AASHTO T 84 Specific Gravity and Absorption of Fine Aggregate	AASHTO T 85 Specific Gravity and Absorption of Coarse Aggregate	AASHTO T 335 Coarse Aggregate Angularity (minimum)	AASHTO T 304 Uncompacted Void Content of Fine Aggregate (minimum)	ASTM D 4791 (8.4) Flat and Elongated Particles (maximum)	AASHTO T 176 Clay Content/ Sand Equivalent (minimum)	AASHTO T 327 Coarse Micro-Deval (maximum)	AASHTO T 96 Los Angeles Abrasion (maximum)	Washington State DOT Test Method T 113, Determination of Degradation Value
Fine Aggregate [a]	X			X		X			
Coarse Aggregate [b]		X	X[c]		X [d]		X	X[e]	X[f]

[a] Defined as aggregates where ≥15% is passing the 2.36 mm sieve
[b] Defined as aggregates where <90% is passing the 4.75 mm sieve.
[c] In the event the material meets the definition for *both* Coarse and Fine, a Coarse Aggregate Angularity will not be required.
[d] ASTM D 4791 will only be required if ≥10% percent is retained on any individual sieve larger than the 1/4inch.
[e] The Los Angeles Abrasion shall be tested if the aggregate is requested for use in UTBWC
[f] The Washington Degradation test shall not be performed if there is inadequate material on the applicable sieves.

The Department shall test each individual aggregate product for the properties listed in Table 1 against the criteria in Section 703.07. If an aggregate product meets the definition for both fine and coarse aggregate, then it shall be tested and evaluated for all applicable criteria in Table 1. If the proposed aggregate fails to meet consensus quality criteria for the requested ESAL level it may either be reduced to a lower ESAL level or be rejected. The HMA supplier may submit a written request for resampling of the aggregate to the Assistant Pavement Materials Engineer accompanied by an official test report showing all requirements being met. The test must have been performed within the previous three months and must have been performed and documented in accordance with the specified AASHTO and ASTM requirements. Once this information is received by the Assistant Pavement Materials Engineer, the Department will, itself, procure new samples of the affected aggregates from the plant location to run the retest. If the retest sample meets criteria, that result shall be the value of record, and the aggregate shall be

approved. If the retest fails to meet criteria the aggregate shall be rejected by the Department with no further retest permitted without corrective action made by the Supplier.

2. AGGREGATE PRODUCTION MONITORING

The Department shall acquire production verification samples of individual aggregates for HMA during the construction season. Samples will be taken at an interval of approximately 5,000 tons per individual aggregate product per plant. Table 2 below displays the criteria to be used for production verification aggregate samples:

Table 2: HMA Aggregate Production Verification Requirements

Estimated Traffic, Million 18 kip ESALs	AASHTO T 84 Specific Gravity and Absorption of Fine Aggregate	AASHTO T 85 Specific Gravity and Absorption of Coarse Aggregate	AASHTO T 335 Coarse Aggregate Angularity	AASHTO T 304 Uncompacted Void Content of Fine Aggregate	ASTM D 4791 (8.4) Flat and Elongated Particles	AASHTO T 176 Clay Content/ Sand Equivalent	AASHTO T 327 Coarse Micro-Deval [b]	AASHTO T 96 Los Angeles Abrasion [a b]	Washington State DOT Test Method T 113, Determination of Degradation Value [a]
							b	a, b	a
< 3.0	Target ± 0.030	Target ± 0.030	≥ 75/60	≥ Target - 3% Blend	≤ 10	≥ 45	≤ 18.0%	≤ 40.0%	≥30
3.0 to < 10			≥ 90/80			≥ 50		≤ 35.0%	
≥ 10			≥ 95/90					≤ 30.0%	N/A

[a] The contractor can request assessment by Los Angeles Abrasion or Washington Degradation in lieu of Coarse Micro-Deval during the approval request.

[b] Individual coarse aggregate used in UTBWC shall have a maximum Coarse Micro Deval of 18% and maximum Los Angeles Abrasion of 30%.

The Department may reduce the testing frequency of some of the above production verification tests if the material consistently meets the above criteria. Specific Gravity and Absorption shall not have reduced testing.

The following procedure shall be observed in the event of failing production verification aggregate samples:

A. The HMA supplier shall be notified of the failing sample and shall investigate to determine the cause. If the failing test is in aggregate specific gravity the procedure outlined in Section 3: CHANGES IN COMBINED AGGREGATE SPECIFIC GRAVITIES of this policy shall be followed.

B. The HMA supplier shall submit a proposed corrective action letter by the end of the following workday outlining changes to bring the non-conforming material into the required range specified for the material type. The HMA supplier shall cease production with any mix designs using the affected aggregate at the conclusion of the workday if the Department testing indicates that the same properties are failing on 2 consecutive samples until corrective action is made to the satisfaction of the Department.

C. If corrective action isn't made to the satisfaction of the Department, the approval for the aggregate source at the given ESAL level shall be revoked and design approvals using the aggregate source may also be revoked.

3. CHANGES IN AGGREGATE SPECIFIC GRAVITIES

The HMA supplier may request in writing that the aggregate product G_{sb} be reevaluated if accompanied by data from the last month showing a change more than 0.030 from the current target value.

A. Upon notification by the Department of an individual G_{sb} result at least 0.030 from target, the HMA supplier shall send an e-mail to the Assistant Pavement Materials Engineer including their latest G_{sb} test results on the material and any pertinent information from their investigation by the end of the following workday.

B. If the Department has two consecutive G_{sb} failures on an individual source - in addition to step 1 above - the contractor shall specify if they believe the Gsb book value does or does not need to be reset and whether it should be reset to the average of the last 3 G_{sb} test results or the latest test result. If the book value for the material is reset, the impacted designs will be updated with a new mix design G_{sb} target for volumetric calculations.

MaineDOT Policy

APPROVAL OF RECYCLED ASPHALT PAVEMENT (RAP) FOR USE IN ASPHALT MIXTURES

January 31, 2025

1. GENERAL

The Department approves RAP on a stockpile and yearly basis, following the process set forth in these guidelines. RAP from a currently approved stockpile may be included as an ingredient in asphalt mixtures designed and approved under Section 401.03 of the Standard Specifications. Each stockpile at each plant must be approved separately, even if the piles originate from the same material. The stockpile may be separated into multiple piles (up to 3 locations) within the same facility, but they must all be clearly marked, originate from the same material, and have been tested as part of the original qualification procedure.

The Contractor's responsibilities in the process are as follows:

- To obtain the Department's approval of all RAP stockpiles prior to its use on a State project and to deliver test data and samples as required (at least three weeks prior to its use)
- To monitor and preserve the quality and uniformity of the approved material during storage and handling
- Maintain stockpiles within each plant (stockpiles outside plant facility may be approved on a case-by-case basis)

The Department may approve RAP based on its composition and variability in gradation and asphalt content, as explained below, and on visual inspections of the stockpile. The RAP may also be approved based upon the quality of the aggregate contained in the RAP. The Department may withdraw approval of a previously approved stockpile if the requirements of this policy are not met.

The Maximum Percentage Allowed in a mix design will be based on these criteria from testing of the RAP source, as defined in Section 7:PERCENTAGE OF RAP ALLOWED. Approval of a material pertains to its condition as tested and sampled after final processing. If the RAP material is to exist in multiple locations within a plant facility, samples will be taken from each location within the facility. If an approved material is to be re-processed later in a manner which appreciably alters the gradation, the material must be re-approved in its reprocessed condition. This does not apply to removal or re-crushing of oversize particles during production.

The Contractor may have up to three different classified RAP stockpiles in each plant facility. If one RAP stockpile is used in multiple plant facilities (i.e. trucked from its original source and crushing location to multiple plants), it shall be given a unique designation in each plant facility.

The stockpile shall be qualified separately or have an approved transfer between plants as stated in Section 6: RAP TRANSFER BETWEEN PLANTS.

The Contractor may elect to fractionate RAP to improve consistency & quality of the material. Fractionated RAP will be approved under the following two methods:

A. The RAP material is fractionated into different portions (coarse & fine), and then blended together at particular rates to create a resultant pile with a desired gradation etc. The resultant RAP is fed into the HMA plant in one cold feed bin. In this case, the Department will approve the resultant stockpile only, not the individual piles the resultant pile was created from. All later verification samples will be sampled from the resultant pile and replenishment of the pile by blending of the fractionated pile will be allowed.

B. The RAP material is fractionated into different portions (coarse & fine), and then fed into separate cold feed bins in the HMA plant. In this case, the department will approve the individual fractionated stockpiles separately, with a RAP designation for each pile. The plant will be required to have continuous recordation of the bin rates for each RAP bin so that the specified blend in the mix design can be maintained by the Contractor and verified by the Department. The blended RAP entered into the plant must meet the requirements of the classification level corresponding to the amount of overall RAP used in the mixture (i.e. If a Class I and Class III are used in one mixture at 20% total, the blend must meet the requirements of a Class II). If the Contractor elects to use more than one RAP source in a design, the Contractor shall provide an acceptable point of sampling blended RAP material from the feed belt.

2. RAP APPROVAL OVERVIEW

The Contractor shall submit requests for RAP stockpile approval to the Assistant Pavement Materials Engineer, using the latest version of the "MaineDOT RAP Qualification Request Form (.pdf)" found on the state internet site. The Contractor shall submit results from RAP testing as prescribed in Section 3 along with the request. A visual inspection of the RAP stockpile will be performed by the Department to ensure that the material is free of contaminants (i.e. wood, brick, deleterious materials, etc.) The Department will obtain samples from the RAP stockpile for laboratory testing and evaluation. The Department will test the samples to identify their mineral components and to determine the aggregate specific gravity, gradation, asphalt cement content, and variability of composition. The residual aggregate may also be tested in the Micro-Deval apparatus for its loss value. The Department will use the testing results and the criteria in Part V to determine the Maximum Percentage Allowed for the RAP stockpile. The Department may adjust the amount and nature of testing required according to the history and nature of the material.

Upon completion of testing and visual inspection, the Assistant Pavement Materials Engineer will approve or disapprove the material by letter and will assign a Stockpile Identification for each approved RAP stockpile. Note: The average gradation and asphalt content from Department testing shall be used in subsequent mix designs using the RAP stockpile. The Department may

elect to issue a provisional RAP approval prior to completion of Micro-Deval testing if the same RAP source has a passing Micro-Deval result within the previous 12 months. The Contractor may continue with mix design approval and production with the provisional RAP approval. The RAP approval report will be re-issued by the Department when Micro-Deval testing is complete. If the Micro-Deval value fails to meet the criteria in Table 3, the provisional RAP approval shall be retracted, and the use of the RAP source will not be permitted. Where the maximum percentage allowed is low due to excessive variability, the contractor may elect to improve the uniformity of the material by further processing and may again sample, test, and request approval for the material.

The Contractor may request to add a new RAP stockpile location to an already existing and approved stockpile. If the Department has not previously tested that location, verification samples (typically 1-3) of the new pile location will be required. The samples will be tested for asphalt content and gradation. If the verification samples fall within the required ranges, the stockpile will be approved under the already established designation. The stockpile will be required to be signed appropriately and would be subject to further verification testing.

3. RAP REQUEST SUBMITTAL

To request approval of a RAP stockpile, the Contractor must submit the following documents to the Assistant Pavement Materials Engineer (it is the requester's responsibility to correctly address, label, and deliver these submittals):

- Contractor's Request for RAP Stockpile Approval
- The Classification Level (I, II, or III) that is being requested.
- Test reports of last ten asphalt contents and gradations (must be within the last six months). The test reports must indicate the testing method used for asphalt content determination.
- A drawing/map of the plant site showing the location of the stockpile(s) to be approved *and labelled locations of all other stockpiles on the premises*.
- Global positioning system (GPS) coordinates, in decimal form, of the RAP stockpile(s) in all its locations.

Note: RAP stockpile approval requests for the next construction season should not be sent to the PME prior to Nov 1st

4. AGENCY PROCEDURE

Upon receipt of the RAP Stockpile Approval request, the Department shall obtain a minimum of six individually labeled samples, approximately 15 kg each, from at least six different positions in the stockpile(s). The material sampled must be in its final condition, after all crushing and screening. If there are multiple locations of the stockpile, all must be listed on the request form and at least one sample will be obtained from each location of the stockpile.

A. The asphalt binder content of each of the six individual samples will be determined as specified in AASHTO T 164. Approximately 2 kg of material will be required for each test.

B. The gradation of the aggregate portion of each individual sample obtained from Step 2 will be determined according to AASHTO T 30.

C. The values for asphalt binder content, and gradation of the stockpile will be expressed as the numerical averages of the data obtained from the six representative samples.

D. The residual aggregate from the RAP samples will be combined to create one Coarse Micro-Deval sample (Grading C/Table 3). The 1.5 kg sample will be tested according to AASHTO T 327. The sample shall be sieved, according to AASHTO T 30, after testing. The Micro-Deval loss value must be less than or equal to 18.

E. The residual aggregate from the RAP samples will be used to evaluate the combined specific gravity of the aggregate. The fine and coarse portions of the aggregate will be tested separately according to AASHTO T 84 and AASHTO T85 respectively. The combined aggregate specific gravity will then be calculated as a combination of the fine and coarse values.

F. The standard deviation of the asphalt binder content of the RAP material shall be calculated using an *n-1* procedure. The standard deviation value will be used in Table 3 to determine the Maximum Percentage Allowed.

5. RAP APPROVAL EXTENSIONS

RAP approval extensions are source approvals that are extended from one year to the next. The source approval is tied to the plant location where it was initially approved and must have had verification samples taken to confirm its consistency.

The Department will accept requests for the extension of existing RAP piles which were approved the previous year, to include previous carryover approval. RAP extension requests shall be made individually through email to the Assistant Pavement Materials Engineer and include:

- An updated drawing/map of the plant site showing the location of all stockpiles
- The latest MaineDOT "SUMMARY of RAP TESTING" Report for the approved stockpile listing a verification sample within the last year
- Test results of contractor's last ten asphalt contents and gradations with calculation of the average and standard deviation (must be within the last six months). The test reports must indicate the testing method used for asphalt content determination.

The Assistant Pavement Materials Engineer will compare the latest contractor results to the contractor results on the initial approval, and latest verification results to the Department's results on the initial approval to see if they indicate a change that exceeds the values listed in Table 3 in Section 7: PERCENTAGE OF RAP ALLOWED and RAP Verification Limits listed

in Table 4 in Section 9: PRODUCTION MONITORING for the previous approval classification. If no verification samples have been taken over the last year, then one will be required for assessment. If approved, the pile will maintain its previous stockpile identification and a new report will be issued.

6. RAP TRANSFER BETWEEN PLANTS

RAP transfers between plants are approved RAP sources in one plant that have been shipped to another plant within the same company.

The Department will accept requests for transfer between plants of RAP piles which were approved the previous year. RAP transfer between plants requests shall be made individually through email to the Assistant Pavement Materials Engineer and include:

- MaineDOT RAP Qualification Request Form (.pdf)
    - Comment stating the source RAP pile designation
- An updated drawing/map of the plant site showing the location of all stockpiles
- The latest MaineDOT "RAP Classification Test Report" for the approved stockpile at its original source location.

The Department will assign a new individual RAP stockpile identification number and take a process control sample of the new RAP stockpile at the secondary location. The new process control sample along with the samples taken as part of the original source pile qualification will be used to verify the material meets the criteria listed in Section 7: PERCENTAGE OF RAP ALLOWED. If the new pile meets the previous pile classification, then carryover approval between plants may be granted.

7. PERCENTAGE OF RAP ALLOWED

The maximum allowable percent of RAP shall be determined by the asphalt content, the percent passing the 0.075 mm sieve, the ratio between the percent passing the 0.075 mm sieve and the asphalt content, and Coarse Micro-Deval loss values as tested by the Department. The standard deviation of at least six RAP samples will be used in the determination. Statistical outliers shall not be considered in determining the asphalt content or percent passing the 0.075 mm standard deviation. Statistical outliers shall be determined in accordance with Section 106.7.2 Statistical Outliers. Where one result is determined to be a statistical outlier, two or more additional samples shall be tested. The outlying value of all tests shall then be excluded from the standard deviation calculation. The maximum percentage of RAP allowable shall be the lowest percentage as determined according to Table 3: Maximum Percent RAP According to Test Results below:

Table 3: Maximum Percent RAP According to Test Results

Classification	Maximum RAP Percentage Allowed	Percent passing 0.075 mm sieve standard deviation	Asphalt content standard deviation	Percent passing 0.075 mm sieve / asphalt content ratio	Residual aggregate M-D loss value
Class III	10%	N/A	≤ 1.0	≤ 4.0	≤ 18
Class II	20%	≤ 1.0	≤ 0.5	≤ 2.5	
Class I	30%	≤ 0.5	≤ 0.3	≤ 1.7	

8. STOCKPILE IDENTIFICATION SIGNS

RAP stockpiles shall be identified with posted signs displaying the identification assigned to the stockpile by the Department in the approval letter. These signs shall meet the requirements of 401.072 Stockpiles. If a stockpile exists in two or more parts, each part must have its own sign.

9. PRODUCTION MONITORING

The Department will monitor RAP asphalt content and gradation during production by testing samples from the stockpile at approximately 15,000 T intervals (in terms of mix production). The allowable variance limits (from the numerical average values used for mix designs) for this testing are determined based upon the maximum allowable RAP percentage and are shown below in Table 4: RAP Verification Limits.

Table 4: RAP Verification Limits

Classification	Asphalt content (compared to aim)	Percent passing 0.075 mm sieve (compared to aim)
Class III	± 1.5	± 2.0
Class II	± 1.0	± 1.5
Class I	± 0.5	± 0.7

The following procedure shall be observed in the event of failing RAP production samples:

A. The Contractor shall be notified of the failing test and shall investigate to determine the cause.

B. By the end of the following workday the contractor will submit a letter to the Department including the results of their investigation. Depending on the results of the contractor's investigation the Department may promptly obtain an additional sample for testing. If Department testing indicates that the same initial and re-test properties fail to meet criteria, the Contractor shall be required to submit a proposed corrective action letter by the end of the work day outlining changes to bring the non-conforming material into the required range specified for the material type (further processing, etc.) Failure to do so will be treated as a second incident under 106.4.6 QCP Non-compliance. If the corrective action proposed by the Contractor involves changing the aim design values of the RAP material, re-classification of the RAP material may be required by the Department. In this case, additional samples shall be obtained by the Department and tested for asphalt content and gradation. The Department will re-qualify the RAP stockpile according to the results of samples (including those from the production monitoring) and Table 3. In cases where the corrective action is to change the aims of the RAP source by re-classification, the Department may require that RAP content of mixes produced during the sampling and testing process be reduced by up to 10%. If the maximum allowable percentage for the RAP pile remains the same according to Table 3, the stockpile will be allowed for continued use by the Contractor and the numerical averages for the asphalt content and gradation will be used for designs. All mix designs will be updated to reflect the change. If the maximum allowable percentage according to Table 3 decreases, the Contractor's mix designs using the RAP source will be required to be redesigned.

10. DEPLETION OF STOCKPILE AND EXPIRATION OF APPROVAL

Approval of a stockpile may be withdrawn by the Assistant Pavement Materials Engineer if the RAP stockpile has been depleted. The approval for RAP stockpiles may last for one year and stockpiles must be reapproved on a yearly basis unless an extension is approved according to Section 5: RAP APPROVAL EXTENSIONS. This shall apply to all stockpiles, regardless of status or history of use.

11. CONTRACTOR RECORDS

The Contractor shall maintain records at each plant site for all RAP stockpiles. These records shall be available for inspection by representatives of the Department and shall include the following:

- All test results.
- The Department's approval report for each stockpile and replenishment, together with the Contractor's requests for approval and all data submitted therewith.
- A current drawing of all stockpile locations at the plant site, including unapproved stockpiles, showing stockpile identifications of all stockpiles approved for State work.

MaineDOT Policy

HMA MIX DESIGNS

January 31, 2025

SPECIFICATION HMA MIX DESIGNS

The following sections shall apply to specification hot mix asphalt (HMA) that is covered by the Standard Specification 401 – Hot Mix Asphalt Pavement and Special Provision 403 – Hot Mix Asphalt Pavement.

1. MIX DESIGN SUBMITTAL

The HMA supplier shall design HMA in accordance with the process described in AASHTO R 35. The HMA supplier shall provide the following information with the mix design submittal:

- Job Mix Formula (JMF) summary information including:
  - Aim gradation and binder content (total AC percent and new AC percent)
  - Volumetric property values (VMA, VFB, & F/Be) at aim gradation binder content
  - Mixture specific gravity values (G_{mm})
  - Sample weight for G_{mb} samples in grams that Contractor uses for 115 mm height at N_{design}.
  - Design aggregate structure summary including proposed percentage by weight of each product
  - Requested ESAL level for the design.
  - Plant number
- Type of mixture being requested, so that the proper designation can be assigned. The cover sheet shall specify which of the following cases apply for the mixture:
  - F = fine-graded
  - C = coarse-graded
  - L = hydrated lime
  - M = fine micro-deval approved
  - R = contains RAP
  - T = thin lift mixture
  - S = special areas mixture
  - B = asphalt-rich base
  - UTB = ultra-thin bonded wearing course
- Coarse (C) or Fine (F) designation will be determined in accordance with AASHTO M 323 Superpave Volumetric Mix Design - Table 5.

Table 5—Gradation Classification

PCS Control Point for Mixture Nominal Maximum Aggregate Size (% Passing)					
Nominal maximum aggregate size	37.5 mm	25.0 mm	19.0 mm	12.5 mm	9.5 mm
Primary control sieve	9.5 mm	4.75 mm	4.75 mm	2.36 mm	2.36 mm
PCS control point, % passing	47	40	47	39	47

- Trial blends testing information including all of the following:

  - Test results (AC, Air Voids, VMA, VFA, F/Be, G_{mm}, G_{mb}, $\%G_{mm}$ @ N_{ini}) for at least 3 different asphalt contents
  - Design aggregate structure trial blend gradation plot (0.45 power chart)
  - AC vs. Air Voids trial blend curve.
- Current PGAB QC Plan (unless MaineDOT already has one on file). Only one PG supplier per PG grade per design will be allowed. The HMA supplier shall request approval from the Department for a change in PGAB supplier or source by submitting documentation to the Assistant Pavement Materials Engineer stating the new supplier or source a minimum of 24 hours prior to the change.

2. MIX DESIGN REVIEW

The Department shall review and approve HMA mix designs with the following process:

A. Review of HMA Supplier's Documentation

The Department will review the documentation provided by the HMA supplier to ensure that the proper mix design procedure was used, that the proposed JMF meets all requirements, and that all required documentation was submitted. No HMA mix design will be approved for use if there is a deficiency in any of these criteria. The Department will provide the HMA supplier the JMF designation and a copy of the pending design.

B. Review of Requested Aggregates (Individually and Blend)

The Department will review aggregates to be used in the proposed design. If no book values for the aggregates have been generated through the approval process, then the design cannot proceed until that effort is completed. The proposed aggregates will be compared against the individual criteria on Section 703.07 for the requested ESAL level to ensure compliance. For the properties for which a mix design blend is used as criteria (Fine Aggregate Angularity, Fine Micro-Deval, and Combined G_{sb}), the Department will generate an aim for the design by calculating a weighted average based upon the individual aggregate book values and their percentage usage in the mix design. If RAP is included in the mix design, the RAP must be accepted through the approval process for the design to proceed. This information shall be provided on the pending design released to the HMA supplier.

C. Mix Design Verification

The Department will perform laboratory verification testing of new HMA designs on samples of the mix trial batched by the HMA supplier according to the proposed JMF at the designated plant. The HMA Supplier shall submit trial batch verification samples to either the Freeport Laboratory or Central Laboratory, as determined by MaineDOT. The HMA supplier may submit up to three samples of the same mix design from different batches at any one time to the appropriate laboratory, provided they are accompanied with an indication of the preferred order of testing. Verification samples provided to the Department shall be accompanied by the corresponding recordation documentation (i.e. batch or drum ticket) for its production. The documentation shall be signed and dated by the QC person who is submitting the Verification sample for consideration. The

documentation and test report shall also be emailed to the Assistant Pavement Materials Engineer and Laboratory Testing Engineer. The sample box and corresponding production documentation shall be clearly marked with the MaineDOT JMF designation and date of sampling.

The Department will use the criteria given in Section 401 of the Maine Standard Specifications to evaluate the aggregate consensus quality testing and the following criteria to evaluate proposed mix designs (unless modified by special provision):

Table 5: HMA VERIFICATION CRITERIA

Property	Criteria
PGAB Content	Design Value ± 0.4%
Air Voids at N_d	Design Value ± 1.5%
Voids in the Mineral Aggregate (VMA) minimum by NMAS	See Section 401.03 Composition of Mixtures Table 1
Voids Filled with Binder (VFB) by NMAS	See Section 401.03 Composition of Mixtures Table 1
Fines/Eff. Binder Ratio	0.6-1.2
Gradation*	Passing 4.75 mm and larger sieves: Target ±7% Passing 2.36 mm to 1.18 mm sieve: Target ±4% Passing 0.60 mm: Target ±3% Passing 0.30 mm to 0.075 mm sieve: Target ±2%
Passing NMAS sieve minimum	90.0%
Aggregate G_{sb}	Design Value ± 0.02
Average G_{mm}	Design Value ± 0.02

* The HMA gradation shall also meet the applicable Aggregate Control points for the NMAS mixture in Section 703.09 HMA Mixture Composition

3. MIX DESIGN APPROVAL

Approval of the proposed HMA mix design shall require each of the following:

a. Receipt of all required information with the JMF indicating compliance with all requirements.
b. Acceptable aggregate properties (including consensus qualities, gradation, G_{sb}, etc.)
c. Acceptable test results on the trial batch verification sample (including volumetrics, asphalt content, Gmm, etc.)
d. Acceptable PGAB properties.

The Department may allow the approval of a new mix design based on an existing approved design without aggregate consensuses qualities testing if approved by the Assistant Pavement Materials Engineer and Pavement Quality Manager.

Approval of a mix design may be withdrawn, and its use terminated when any of the following occur:

a. The maximum specific gravity of the mix as indicated by testing of acceptance samples varies from the design value by more than 0.030.
b. MaineDOT testing indicates unacceptable material qualities or mix properties.

c. MaineDOT approves an updated design for the same mix.
d. The average of gradation sieve results from Acceptance testing are outside of the mix design's aggregate gradation control points as stated in Section 703.09 HMA Mixture Composition.
e. Three consecutive Acceptance tests are outside of specifications on the same property.
f. The mixture exhibits undesirable characteristics such as checking, shoving or displacement.
g. RAP production monitoring results in a reduction in the Maximum Allowable RAP Percentage below the total RAP percentage listed in the JMF.

Mix designs will be deactivated at the end of every year.

4. MIX DESIGN APPROVAL EXTENSIONS

The Department will accept requests for the extension of existing HMA mix designs which were approved and used for production within the previous two years. Mix design extension requests shall be made through email to the Assistant Pavement Materials Engineer. Extension approval requests for the next year may be made after October 31st of the current year. The Supplier shall provide an updated cover sheet to the Department to include any revisions as required in this policy. The supplier shall identify the company name, plant location, mix type, and mix design number. If the JMF uses RAP, the Contractor shall also identify the new RAP source to be used in the JMF and at what percentage. MaineDOT will automatically adjust the G_{sb} value for the JMF to reflect changes in individual aggregate and RAP source G_{sb}. The G_{sb} value of the design will be updated via the following equation:

$$Change\ in\ Design\ Gsb = (New\ Source\ Gsb - Old\ Source\ Gsb) \cdot Source\ Content$$

For Example:

$$(2.700 - 2.600) \cdot 20\% = +0.100 \cdot 0.2 = +0.020$$
$$(2.660 - 2.760) \cdot 10\% = -0.100 \cdot 0.1 = -0.010$$

The HMA supplier shall also provide the PGAB supplier, refiner, and location information for each grade to be used in each design extension at the time of request. The decision of whether to approve such a request will be based on the most recent past performance of the mix as determined by the results of Acceptance testing and field performance.

A. If the mix design was approved and used for production on Department projects in the previous construction season a trial batch verification sample may not be required.
B. If the mix design was approved but not used for production on a Department project in the previous construction season, a passing trial batch verification sample will be required prior to approval.

The approval of the extension shall also require that the annual testing of the aggregate components meet applicable criteria. If approved, the supplier will receive written approval (may be in electronic form) from the Department. If a new design was submitted but not used and

approved during the previous year, original submissions may be accepted if approval and use occurs within 12 Months of the original design submission.

5. MIX DESIGN AIM CHANGES

Changes to the design target percentages for the mix design will be allowed in accordance with Section 401.03 Composition of Mixtures if they meet one of the following conditions:

1. submitted to the MaineDOT Assistant Pavement Materials Engineer along with the request to extend the mix design prior to mix production,

2. submitted to the Assistant Pavement Materials Engineer prior to the reporting of the first Acceptance result from the Mix Design for the year,

3. submitted to the Resident and Assistant Pavement Materials Engineer at the completion of a day of production and completion or termination of Lot. The aim change will only be approved by the Department if the Supplier documents that all the Lots using the JMF are completed or terminated.

When aim changes are requested, the Supplier shall provide an updated cover sheet for the design with the new targets. The Supplier shall also state the original value and the revised value in the request for each value being changed.

Cumulative changes to extended designs shall not exceed the following tolerances when compared to the original approved mix design:

- Passing the 4.75 mm or larger sieves: 4%
- Passing the 2.36 mm sieve to 0.075 mm sieve: 3%
- PGAB Content: 0.3%
- G_{mm} 0.015

SPECIFICATION LCP MIX DESIGNS

The following sections shall apply to specification hot mix asphalt (HMA) that is covered by the Special Provision 461 – Light Capital Paving.

6. LCP MIX DESIGN SUBMITTALS

The HMA supplier shall submit a mix design with an asphalt content aim at or near 6.7% for the LCP mixture with supporting test data meeting the requirements of this Policy and Procedures Manual. The HMA supplier's suggested asphalt content shall produce air voids between 4.0% to 8.0% when tested according to AASHTO T 312 at an N_{design} of 65 gyrations. The suggested asphalt content aim shall be based upon at least three different asphalt content trials. MaineDOT will independently determine the target PGAB content following submission of the Job Mix Formula and all related aggregates through the same process. The Department may require the design to be resubmitted if it fails to meet the requirements of this policy. The HMA supplier shall provide the following information with the mix design submittal:

- Job Mix Formula (JMF) summary information including:
  - Aim gradation and binder content (total AC percent and new AC percent)
  - Mixture specific gravity values (G_{mm})
  - Individual stockpile identification information required in Section 105.8.6 of the Maine Standard Specifications (aggregate source, pit name, owner, location, etc.)
  - Individual stockpile gradation summary
  - Sample weight for G_{mb} samples in grams that Contractor uses for 115 mm height at N_{design}.
- Trial blends testing information including all of the following:
  - Test results (AC, Air Voids, G_{mm}, G_{mb}) for at least 3 different asphalt contents
  - AC vs. Air Voids trial blend curve.
- Current PGAB QC Plan (unless MaineDOT already has one on file). Only one PG supplier per PG grade per design will be allowed. The HMA supplier shall request approval from the Department for a change in PGAB supplier or source by submitting documentation to the Assistant Pavement Materials Engineer stating the new supplier or source a minimum of 24 hours prior to the change.
- Safety Data Sheets (SDSs) for PGABs (unless MaineDOT already has one on file.)
- Target date for which the JMF approval is needed or a priority list with dates for approval of multiple submitted JMFs as needed for production by the HMA supplier.

Note: The Department will not be adding an assumed quantity of dust into the LCP mixture during laboratory batching as the Department can't confidently and consistently replicate aggregate breakdown through the plant.

MaineDOT Policy

HMA Field Sampling Policy

March 1, 2019

Sampling Equipment

Square ended shovel (side extensions recommended; if available)
HMA mix thermometer 50 - 500 deg F (10 - 260 ºC)
4 - 14 to 16 quart galvanized or stainless-steel metal pails
4 – 12 - 15,000g boxes
Quartermaster or equivalent splitter

Note: Sampling shovel should be clean and free from any contaminants that may compromise the HMA sample. If cleaned or coated with release agent, allow excess to drain off and work back and forth through mix prior to sampling. The use of fuel oil to clean the sampling tools will not be permitted onsite.

The Department paving inspector may request that the Contractor's QC technician assist in the sampling process. If the Contractor QC technician agrees, then the Department paving inspector must be present and active for all sampling and observe the process. The Contractor's QC technician may only assist in creating the "shelf", shoveling the mix, and transporting and lifting pails of HMA.

Procedure: Sampling from Paver hopper

- Random samples shall be determined by station and offset, or by tonnage. The Department and the Contractor shall agree as to the method of random number generation. (i.e.: area or tonnage)

- All random sample locations are to be determined prior to HMA production and placement.

- The procedure for notifying the Contractors representative of "intent to sample" should be discussed at the pre-paving meeting.

- Verify the random location or tonnage is approaching.

- Notify the Contractors representative of the intent to sample, making sure that the haul truck is on-site prior to notification.

- Identify the haul unit to be sampled from. Note: If sampling by tonnage, the randomly chosen tonnage is to be used only to identify the haul unit to be sampled and does not imply that the sample should include material from that exact tonnage figure. In cases where a portion of a

sampled load is not used on the project, or is used but not paid for, the sample obtained will still be used in determining payment as long as the material in the paver hopper at the time of sampling is placed on the roadway. If the material is later removed due to poor workmanship or smoothness, the sample shall still be considered to represent the sublot for which it was sampled.

- Notify the Contractor's QC technician of the intent to take a sample off the haul unit.

- Insert thermometer into haul unit (or in HMA material if already in hopper.)

- Record slip number, time of sampling, temperature of mix, and station/lane.

- Discharge the HMA pavement so the material flows into the hopper in one continuous mass. The Contractor should control the discharge of material into the paver hopper.

- The sample should be taken from the center of the overall load. (middle 1/3)

- Make sure the hopper is full of mix at time of sampling.

- Have the Contractor lower the truck body in a manner to minimize spillage.

- Have the truck move out and away from the hopper. The truck should be moved away a minimum of 30 feet and parked. Have the driver shut down the engine as a safety precaution.

- Have the paver stop, apply brakes, and /or shut down engine.

- For safety, the Contractor's person controlling the truck should remain in full view of the driver to ensure that the truck does not back towards the paver while others are sampling.

- When all equipment is secured, begin the sampling process.

- Remove the top 8-10" of mix across the center of the paver hopper, being careful not to sample within 1.5 feet of the hopper sides. (see image)

- Trim the front of the area to be sampled to form an 8" vertical face.

- Obtain a sample by digging into the vertical face horizontally until the shovel is full, being careful not to overfill the shovel.

- The Department shall determine cooperatively, with the onsite Contractor representative, whether the shelf and sample are acceptable. If it is determined that the sample is compromised, the sampled material will be discarded and a new representative sample taken from the same haul unit. Once the sample has been taken and placed in the sample container, samples will not be discarded.

- Split and fill the sample containers using the MaineDOT accepted method, being careful to minimize spillage (see image). The quartermaster splitter requirement may be waived for Ultra-Thin Bonded asphalt mixtures if addressed in the QCP.

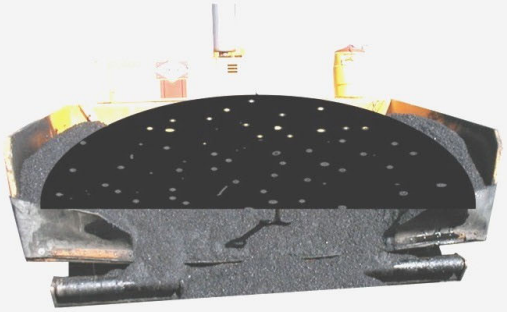
- Insert / attach the completed sampling paperwork (Id tag) into the sample container, with a number from the security tape recorded in the comments section. Finally, secure the cover.

- Record the required information on the front side of the sample container (Ref. #, etc.). Be certain to place the security tape on the back of the box as shown in the illustration.

- All samples should be secured immediately in the transport vehicle. The sample shall be transported to the appropriate MaineDOT laboratory within the timeframe required in Section 401.20 of the standard specification. The sample shall be stored in a secure and dry location until and during transport to the laboratory.

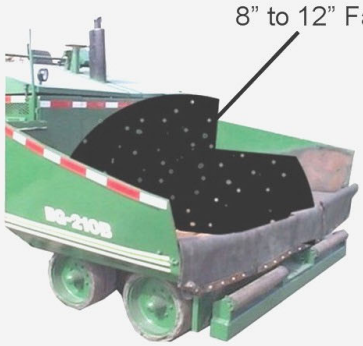
SAMPLING HMA

FROM A PAVER HOPPER



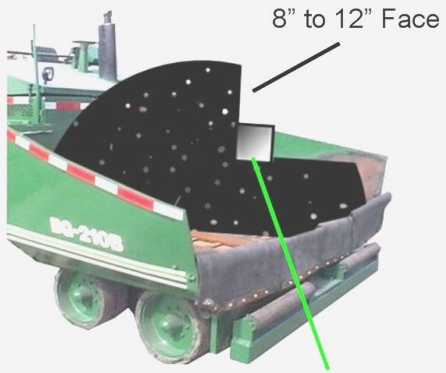
Mix Hump in
Charged Paver Hopper

Random number is selected, in Megagrams or Tons or by Area and applied to the proper truck load.



Cut Away
Side View

Shovel down into the mix 10" to 12" leaving a flat surface 3' to 4' wide.



Sample Area

Then cut in the same distance, leaving a "shelf". Filled the needed number of buckets.

MaineDOT

Cut-away, front view. Ready to begin sampling.

Sampling from prepared area.

MaineDOT Policy
HMA Sampling
Field Splitting Procedure
December 2, 2020

1. GENERAL

The current policy requires the use of the Gilson Quartermaster splitter, or approved equivalent, to split all mix samples down to sample proportions in the field prior to being transported to the designated Acceptance Lab.

- All testing methods require a minimum of 4 sample containers for the Department.

- Place the mix sampled from the designated haul unit or paver hopper into the galvanized pails, being careful not to overfill the shovel.

- Transport pails to the approved splitter that has been properly leveled onsite.

- Mark the sample boxes so the split samples can be identified, and place them under the splitter to receive mix.

- Check to assure that the bottom splitter chute gate is closed and secured.

- Transfer the mix from the pails into the splitter hopper from opposite sides of the splitter, and in a continuous motion to minimize segregation.

- Trip the chute gate and "tap" the hopper sides lightly, if necessary, to help the material flow through the splitter evenly.

- Remove the boxes from under the splitter and prepare them for transport to the Acceptance Lab.

- Continue the procedure to fill all the required sample boxes.

Sample Splitting Details

1) Label the quarters of the splitter from #1 thru #4.
2) Label four sample containers from #1 thru #4 and place them under the corresponding splitter corner.
3) Place two 14 to 16 quart buckets of mix in the splitter hopper and split the mix into the 4 containers.
4) Remove the full containers of mix from the splitter and place an additional four containers, which have been numbered from #1 thru #4 under the splitter.
5) Place the remaining two 14 to 16 quart buckets of mix into the splitter hopper and split into the four containers.
6) At this point there should be eight containers of mix; two labelled #1, two labelled #2, two labelled #3, and two labelled #4.
7) Pair the same numbered containers together and distribute as follows:
    a. Box #1 to the MaineDOT
    b. Box #2 to the Contractor
    c. Box #3 to the Contractor
    d. Box #4 to the MaineDOT
8) Boxes from opposite corners shall be combined to create a single HMA sample. The following combinations will be made to make up the different sample types:
    a. Boxes #1 & #4 will be combined to comprise the Acceptance sample
    b. Boxes #2 & #3 will be combined to comprise the Contractor Acceptance Split sample
    c. Boxes #1 & #4 will be combined to comprise the Dispute sample

Corner #1 MaineDOT Box	**Corner #2** Contractor Box
Corner #3 Contractor Box	**Corner #4** MaineDOT Box

Paving Inspector loads the Quartermaster splitter.

Properly sealed HMA sample.

MaineDOT Policy

HMA Core Sampling Policy

January 31, 2025

All cores are to be stored in the approved core transport container, secured, and protected from the weather and elements. Cores should never be stored where the ambient temperature exceeds 100 deg. F.

- Locate the random sample location as determined by approved procedure, such that the edge is no closer than 9" from any joint (unless a longitudinal joint core).

- Designate the core location by station and offset, and core / sublot number.

- The Contractor shall cut a 6" (150mm) core through the HMA course, at the location designated.

- The Contractor shall extract the core from the roadway using tools and methods that will not cause damage to the core integrity.

- Inspect the core for damage, and / or foreign material adhered to the bottom.

- The Department shall determine cooperatively, with the onsite Contractor representative, whether the core is acceptable, and whether the core needs to be trimmed. At the time of sampling, the Contractor and the Department shall mutually determine if a core is damaged. If it is determined that the core(s) is damaged, the Contractor shall cut new core(s) at the same offset and within 3 ft of the initial sample.

- At the time the core is cut, the Contractor and the Department will mutually determine if saw cutting of the core is needed, and will mark the core at the point where sawing is needed. The core will be saw cut in an MaineDOT Lab by the Department, without disturbing the layer being tested to remove lower layers of Hot Mix Asphalt Pavement, gravel, or RAP. The Department and Contractor representative at the core sampling shall each measure and record the thickness of the core (from the surface to the thin line or bottom of core).

- If the Contractor disputes the validity of the core, either due to its location or its condition, they may appeal to the Inspector to move the cores. If the Inspector does not concur and the Contractor wishes to further dispute the core, they must describe the reason for the dispute in the associated QC report for that day's production. Any necessary details to describe the reason for the dispute should be included in the QC paperwork. In addition, the Contractor shall write a letter describing the reason for the dispute and an explanation of the situation and deliver it to the Resident Engineer, Construction Manager, Pavement Quality Manager, and QA Engineer within

24 hours of the sampling of the core in question. The Department will only consider the dispute of the core if these conditions are met fully.

- If the core is found to be acceptable, and, if necessary, marked for trimming, the core shall be immediately placed in an approved transport case.

- Insert the sampling paperwork along with each corresponding core sample ***(Paperwork atop the core and not beneath),*** then secure and lock the case for transport to the Acceptance Lab. Be certain to record the serial numbers from the locking plastic strips on one of the sample ID forms.

MaineDOT Policy

%G_{mm} POLICY

July 27, 2016

CALCULATION OF PERCENT COMPACTION FOR HMA PAY FACTORS

The percent compaction of HMA pavements will be calculated by dividing the bulk density of the cores in a sublot by the theoretical maximum density (G_{mm}) of the mix in that sublot, as determined by the MaineDOT Acceptance test. Core samples will be identified as coming from a particular sublot by the Resident, based on the core's location relative to the location of the nearest mix sample. In the event that a sublot is partially completed at the end of a paving day, and a mix sample has not yet been obtained from the sublot, and further paving in the lot will not resume on the next working day, any cores obtained on the partially completed sublot will be calculated based on the G_{mm} of the previous sublot unless otherwise agreed to in the field by the Resident or his Representative, and the QC Technician. In the event that no mix samples are taken during a day's production, the Resident may, at his discretion, obtain a mix sample to be tested for G_{mm} only, on which to base that day's cores.

Bulk Specific Gravity (AASHTO T 166)
Maximum Specific Gravity (AASHTO T 209
Superpave Gyratory Testing (AASHTO T 312)
Asphalt Content by the Ignition Method (AASHTO T 308)
General Laboratory Procedures
Calibration of RAP mixes

ACCEPTED SUPPLEMENTAL REQUIREMENTS
Bulk Specific Gravity (AASHTO T 166)

1. HMA pavement cores shall be tested in accordance with Method A using the alternative vacuum drying method described in Section 6.1 and the sequence of steps described in Note 2 (Submerged→SSD→Dry). If the apparatus automatically cycles until all moisture is removed from the sample, it is not necessary to run the sample a second time. Each day of use after performing the warm-up and self-test procedures and before performing any sample testing, operate the unit without any specimens in the chamber and confirm the pressure reading is 6 mm Hg or less. Confirm that the surface temperature of the specimens is between 15 and 30°C (60 and 80°F) using a touch of the hand--an infrared thermometer is not necessary. Regular maintenance shall be performed on the apparatus.

2. The submerged weight of the core or compacted specimen shall be taken as nearly as possible at an elapsed time of 4 minutes.

3. Cores to be tested in the laboratory which require sawing shall be clearly marked to indicate the location of sawing. Because sawing of cores is to be agreed upon between the Resident or his representative and the QC Technician, no sawing in the laboratory shall be performed unless the core is thus marked.

4. When drying a core to the saturated-surface-dry condition, a damp cloth—one from which no moisture can be wrung—shall be used.

5. The wire/line used to suspend the core or compacted specimen in the water bath shall be of the smallest practicable size.

ACCEPTED SUPPLEMENTAL REQUIREMENTS
Maximum Specific Gravity (AASHTO T 209)

1. The bowl (weighing in water) method shall be used to determine maximum specific gravity.

2. A mechanical shaker shall be used to agitate the maximum specific gravity sample as described in Test Method A.

3. The required vacuum to which the sample in the container shall be subjected is 30 ± 5 mm of Hg. This vacuum shall be verified with an in-line spirit-filled manometer, or a residual pressure manometer traceable to NIST as illustrated in Figure 1 of the AASHTO method.

4. Two maximum specific gravity tests shall be performed for each sample with the average of these two results reported. Replicate Gmm results shall agree within 0.015 of each-other.

5. The maximum specific gravity specimen shall be agitated at vacuum for as close to 15 minutes as possible.

6. During testing, the sample and container shall be submerged in the water bath for as close to 10 minutes as possible.

7. The empty submerged weight of the maximum specific gravity containers shall be recorded each day of testing and used to calculate results for that day.

ACCEPTED SUPPLEMENTAL REQUIREMENTS
Superpave Gyratory Testing (AASHTO T 312)

1. All gyratory compactor settings (angle, ram pressure, speed of gyration) shall be verified once each month during production, and a detailed log shall be maintained in the lab, or electronically in the Compactor.

2. All gyratory compactors used for acceptance shall be calibrated and inspected annually. The proving ring (or other load verification device) for verifying ram pressure shall be calibrated at least every two years.

3. Compaction molds shall be maintained at compaction temperature during testing either by rotating two or more molds from the oven, or by re-heating a single mold in the oven between tests.

4. The mold shall be charged with material by dumping from a pan directly into the mold using a funnel that has been approved by the Department. The mold shall be charged in a single lift without scraping the pan. Thermometers used to measure mix or oven temperatures shall be standardized on an annual basis at a minimum.

5. The DOT labs shall fabricate two bulk specific gravity samples of the same mass used by the Contractor as indicated on the job mix submittal. The average of these two results shall be reported.

6. The temperature of each specimen shall be verified to be at compaction temperature in either the gyro mold or heating pan immediately prior to testing.

7. All gyratory compaction specimens shall be directly split to a mass as close as possible to the required testing size and then adjusted to the testing size by the addition or removal of mix.

ACCEPTED SUPPLEMENTAL REQUIREMENTS
Asphalt Content by the Ignition Method (AASHTO T 308)

1. The ignition method of determining asphalt content shall be used, exclusively.

2. Ignition furnaces shall be regularly maintained, including bi-weekly cleaning of the element plates, cleaning and lubricating the motor, checking for air leaks, and adjustment of door fit and lock. In-depth cleaning of the motor, chimney, and filter element shall be performed at least every six months.

3. Ignition oven correction factors shall be determined as described in the supplemental procedure section "CALIBRATION OF ASPHALT MIXTURES FOR ASPHALT CONTENT DETERMINATION". Correction factors shall be determined as the average of four specimens tested at 538°C and shall be determined in the Furnace dedicated for testing that job-mix-formula. Samples of identical aggregate compositions may share correction factors.

4. The mass of the ignition furnace sample shall be not less than the specified minimum sample size.

1. Initial and final sample weights shall be taken while the material is in the furnace trays to avoid errors due to loss of material. The asphalt content shall be calculated from these weights, and not from weights indicated by the furnace's display. Consequently, temperature corrections shall not be applicable. Aggregate correction factors to the gradation (as described in AASHTO T 308) shall also not be required.

ACCEPTED SUPPLEMENTAL REQUIREMENTS
General

1. Daily checks shall be performed to ensure that all lab balances are level, and that the water bath temperature is within the required range.

2. All test samples (except for gyratory compaction which requires some manipulation) shall be obtained from a direct split of the entire, recombined sample in accordance with AASHTO R47.

3. All HMA samples, with the single exception of those used for Contractors' quality control testing (but not when the Contractors' QC results are used for acceptance purposes) shall be heated in an oven at compaction temperature for two hours to remove moisture from the sample and bring it to constant mass. After the completion of the heating time, individual test specimens shall be obtained from the original sample by splitting in an approved splitter (such as Quarter Master or Riffle Splitter), or by the cone and quarter method. The two specimens for gyratory compaction shall be reheated to compaction temperature prior to testing.

CALIBRATION OF ASPHALT MIXTURES FOR ASPHALT CONTENT DETERMINATION—Supplemental Requirements
Ignition Method (AASHTO T 308)

1. GENERAL

All HMA samples shall be calibrated and tested in accordance with the requirements of AASHTO T 308, except that all 4 increments shall be used in the calculation of the JMF Correction Factor, and all burns will take place at 538 ºC. This procedure is also intended to provide additional clarification for the preparation and testing of correction samples for mixes containing reclaimed asphalt pavement (RAP).

2. CORRECTION SAMPLE PREPARATION

1. **Determining Aggregate and RAP proportions**

   The mass of each aggregate component, including RAP, to be used in the correction sample shall be determined by multiplying the design percentage of each component by the total mass of the aggregate portion of the sample being prepared. (The total mass of the sample must meet the minimum sample size requirements in T 308.) For example, if the total mass of the aggregate portion of the sample being prepared is 2,000 grams, then the proportions would be as follows:

Component	Design Proportion	Mass
RAP	20%	400 g
19 mm	40%	800 g
Sand	25%	500 g
Dust	15%	300 g
TOTAL	100%	2,000 g

2. **Determining Amount of Virgin Asphalt Required**

   The total percentage of asphalt in the correction sample shall be equivalent to the design asphalt content of the mix. The total amount of asphalt in the sample includes both virgin asphalt added to the sample during preparation and "old" asphalt contained in the RAP component, if applicable. If job-mix-formula contains RAP the MaineDOT-generated asphalt content aim for the approved RAP stockpile shall be used. The mass of virgin asphalt required in the correction sample is simply the difference between the total mass of asphalt required to achieve the design percentage, and the mass of asphalt in the RAP. For example, for a 20 % RAP mix, if the design asphalt content is 5 % and testing indicates that the asphalt content of the RAP is 4.0 %, then the percentage of virgin asphalt required in the sample is 5 % minus twenty percent of 4.0 % (which is 0.8 %), or 4.2 %. The mass of virgin asphalt is then calculated using the following equation:

$$Virgin\ Asphalt\ Mass = \frac{AC\%_{virgin} \cdot Agg\ Mass}{1.0 - AC\%_{virgin}}$$

The mass of asphalt required for mixes without RAP is simply:

$$Asphalt\ Mass = \frac{AC\%_{Total} \cdot Agg\ Mass}{1.0 - AC\%_{Total}}$$

3. Determining Correction Factor

After testing all four samples in a single ignition furnace, the correction factor shall be determined on each correction sample as the difference between the calculated asphalt content and the actual asphalt content. For example, if the actual asphalt content of the prepared correction sample was 5.0 % and the calculated asphalt content of the sample following testing and weighing was 5.36 %, then the correction factor for this particular sample would be 5.36 % minus 5.00 %, or 0.36 %. This value is what must be subtracted from the calculated asphalt content to account for material and testing variables to achieve the correct asphalt content. All other requirements in the method regarding determination of correction factors (except number of samples and temperature) apply.

MaineDOT Policy

POST PAVING CONFERENCE

January 31, 2025

1. GENERAL

A Post-paving conference will be scheduled to take place, preferably onsite upon completion of all method A, B, C and D lots prior to project completion. The purpose of this meeting will be to discuss any quality issues that occurred during construction and to finalize pay quantities and price adjustments, subject to final review by the Contracts section.

The Contractor shall be represented by the Project Superintendent, the QC Plan Administrator or his designated representative and the direct supervisor of the paving, the QC Technician or PC Technician when appropriate.

The Department will be represented by The Project Resident, The QA Engineer or Manager or the Pavement Quality Manager and the Paving Inspector when appropriate. The Senior Project Manager and Project Manager 1 and the Construction Support Manager will also be notified.

MaineDOT Policy

SMOOTHNESS TESTING

January 31, 2025

2. GENERAL

When smoothness testing is required by the contract the Resident will notify the Non-Destructive Testing Supervisor, within 1 week of completion of the mainline surface that the project is ready for smoothness testing and shall provide the following information;

- Contractors name
- Project begin and end station at the construction joints (should be marked on the roadway for the ARAN crew)
- Bridge deck locations (begin and end station for bridge joints)
- Limits of urban areas with speed limits less than 20 mph and/or manhole covers or obstructions in the roadway that will interfere with smoothness tests.
- Railroad crossing location(s)
- Mainline quantity of surface mix excluding shoulders, ramps, side streets and roads, acceleration and deceleration lanes
- Unit cost for surface mix.
- Any stationing equations on the project

The Department will be responsible for ensuring that the testing is performed prior to the Saturday following November 1st in Zone 1 and the Saturday following November 15th in Zone 2. In the event of a snow or sleet storm prior to testing it may be necessary to arrange for sweeping of the pavement prior to testing.

"Courtesy" testing of non-surface layers prior to Winter suspension will no longer be performed by the Department, due to increased demands on the ARAN.

MaineDOT Policy

HMA Repair / Removal Reporting

January 27, 2016

In an effort to keep accurate data available, MaineDOT will keep records of HMA pavement repair or removal during construction. This information will be kept in a central location so that a formal database is kept of the quantities and reasons for pavement repair/removal. This information will be managed as to answer questions from internal staff, the public or the construction industry. It will become the responsibility of the Resident to report any removal or repair of pavement presented for acceptance by the Contractor. Any mix removed prior to the presentation of the mix to the Department will not need to be quantified (i.e. setting back to pull a hot transverse joint again does not count, milling out a transverse joint a week after initial placement does count). This includes removal / repair issues in the following categories:

- Routine removal / repair activities, including but not limited to:
  - Failing surface tolerances at construction joints
  - Butt joint repair
  - Obvious flushing, tearing, or cracking

- Any other removal or repair activities that necessitate involvement from Construction Support / Pavement Quality personnel prior to rework, including but not limited to:
  - Reject density payfactor
  - Segregation
  - Visual deficiencies (i.e. tearing, cracking, shoving, etc.)
  - Reject ride quality payfactor
  - Any proposed sealing of visual defects
  - Any proposed infrared repairs
  - Overlays of deficient pavement

The Resident will be required to report the agreed upon repair / removal as well as quantify the area being treated. The report will be sent via email with subject line “HMA Rework” to all of following personnel:

- Pavement Quality Manager
- Pavement Quality Engineer
- Applicable Project Manager / Construction Manager
- Applicable Assistant Program Manager

The reporting of HMA pavement repair / removal will be expected within one week of the activity. Any questions with this policy can be directed to the Pavement Quality Unit.

MaineDOT Policy

ACCEPTANCE SAMPLE REPORTING POLICY

December 10, 2020

For the purpose of reporting copies of results of the Contractor's split of the Acceptance sample to the QA Engineer prior to the deadline as required in section 401.223 part a. "Dispute Resolution Sampling" in order to maintain the ability to dispute, the test reports shall be e-mailed to the QA Engineer at Contractor.MaineDOT@maine.gov, Disputing will not be allowed if the report is not sent to this e-mail address in addition to being sent to the Project as required. In addition, the Contractor will be required to input results of their split of the Acceptance sample into the approved MaineDOT HMA Acceptance split worksheet and submit it along with their own test report. The worksheet shall be saved in the ".xlsx" format with the reference number as the file name (i.e. 123456.xlsx). The test worksheet can be found on the MaineDOT website. Each mix sample is required to have a separate worksheet, do not submit multiple samples in the same file.

Example of Spreadsheet Input

Mix Split Data		Core Split Data	#1
Reference No. (six digit number only)		Reference No. (six digit number only)	
Binder Content, (%)		Gauge Density, lb/ft^3	
Air Voids, %		Maximum Density, lb/ft^3	
VMA, %		Density, %	
G_{mb}			
G_{mm}			
Percent Passing NMAS, %			
Percent Passing No. 8 [2.36 mm] Sieve, %			
Percent Passing No. 50 [0.300 mm] Sieve, %			
Percent Passing No. 200 [0.075mm] Sieve, %			

MaineDOT Policy

HMA Hamburg Wheel Tracker Testing

January 31, 2025

1. GENERAL

This policy identifies the MaineDOT modifications to AASHTO T 324, Hamburg Wheel-Track Testing of Compacted Asphalt. The policy also provides details on the standardized reporting to be used by MaineDOT and Contractors for results of Hamburg Wheel Tracker (HWT) testing.

2. SAMPLING

HMA Production Verification Samples (for Meeting HWT Requirement)

All HMA sampling for the purpose of mix design approval and verification shall be performed in accordance with the applicable sections of the HMA Policy and Procedure Manual, with emphasis on the HMA Field Sampling Policy and HMA Sampling, Field Splitting Procedure. The Department shall sample and verify the HWT performance of applicable mix designs during production on affected projects. All production verification samples shall be obtained from the paver / material transfer vehicle (MTV) hopper in accordance with the HMA Field Sampling Policy. The verification samples shall be taken in conjunction with normal Acceptance samples whenever possible. In this case, two additional boxes of HMA will be obtained for the purpose of MaineDOT's HWT verification testing. An additional run through the quartermaster will be performed, with the two HWT verification boxes coming from corners #1 and #4. In the event that a HWT verification sample is required to be at an interval not concurrent with a normal Acceptance sample it will be combined with an information sample. The same procedure outlined above will be used, except that the dispute split shall not be necessary and that corner of the quartermaster can be replaced with the HWT verification boxes.

HMA sample boxes for HWT verification samples shall be marked by the paving inspector with the typical information on the box (WIN, Town, JMF, etc.) and shall also have "HWT Verification" clearly written on at least two sides of the box (at least one being the side with the remainder of the identifying information). The HWT verification samples shall be secured in the same manner as the Acceptance samples in accordance with the HMA Field Splitting Policy in this manual. In addition, the sample tag for the Acceptance or Informational sample shall denote in the comments that a HWT verification sample was also obtained (i.e. HWT Verification included).

Informational / Research Samples

HMA samples obtained by MaineDOT for the purpose of research or information gathering (not tied to a HWT requirement) shall be obtained from the paver hopper in a similar manner to the

process outlined for HWT verification samples. The informational or research samples shall only be marked with "HWT" on the sample boxes.

Contractors may submit mix for HWT testing by MaineDOT for informational or research purposes. In order to provide enough material to perform one run of the HWT, three boxes of HMA must be provided. A minimum of five boxes is necessary to perform two runs of the HWT for the mix design. All boxes must be clearly labelled with the following information as a minimum:

- JMF (including proper binder grade used)
- Date sampled
- Box number (i.e. Box 1 of 5 etc.)
- Description of change to mix design made (if applicable, i.e. 10% added natural sand)

3. SPECIMEN PREPARATION

Field Produced Mixtures

All MaineDOT HWT testing shall be performed using Superpave Gyratory Compactor specimens unless otherwise stated. Field produced HMA samples obtained for HWT testing shall be used to prepare specimens using the following procedure in addition to AASHTO T 324:

1. Place boxes of HMA in an oven set at compaction temperature (150°C unless otherwise noted) for a minimum period sufficient to heat mix enough so that it will flow through splitter.
2. Split mix twice through Quartermaster according to AASHTO R 47
3. Split mix to specimen size in an approved splitter or by the cone and quarter method or riffle splitter. Approximately 50-100 grams over the initial mass. Split 6 to 8 pans of material.
4. Set up gyratory compactor:
    - Gyrations to 400 and
    - Compaction method from gyrations to height (62 mm).
5. Heat mix sample to compaction temperature (150°C unless otherwise noted) while monitoring the mix temperature with a digital thermometer.
6. Charge mold according to AASHTO T 312 using specimen with the initial mass.
7. Compact in gyratory compactor to 62 mm ± 1 mm.
8. Extrude specimen and cool to room temperature. NOTE: If need be specimen can cool in mold for a few minutes before moving to counter in front of fan to cool completely.
9. Determine G_{mb} in accordance with AASHTO T 166 then determine air voids according to AASHTO T 269; use worksheet to calculate.
10. Adjust mass if needed.
11. Repeat until you have four specimens at 7.0 ± 0.5 % (6.5 - 7.5%) air voids.

Laboratory Produced Mixtures

Specimen preparation for laboratory blended mixtures shall follow the requirements of AASHTO T 324 and the following steps:

1. Batch mixture proportions in accordance with the desired job mix formula.
2. Use a mixing temperature of 155°C. For polymer-modified asphalt binders, use the mixing temperature recommended by the binder manufacturer.
3. Dry-mix the aggregates and mineral admixture (if used) first, then add the correct percentage of asphalt binder. Mix the materials to coat all aggregates thoroughly.
4. Condition test samples at the appropriate temperature in accordance with the short-term conditioning procedure R 30 (135°C ± 3 for 2 hours unless otherwise noted).
5. Heat mix sample to compaction temperature (150°C) while monitoring the mix temperature with a digital thermometer. For polymer-modified asphalt binders, use the compaction temperature recommended by the binder manufacturer.
6. Charge mold according to AASHTO T 312 using specimen with the initial mass.
7. Compact in gyratory compactor to 62 mm ± 1 mm.
8. Extrude specimen and cool to room temperature. NOTE: If need be specimen can cool in mold for a few minutes before moving to counter in front of fan to cool completely.
9. Determine G_{mb} in accordance with AASHTO T 166 then determine air voids according to AASHTO T 269; use worksheet to calculate Adjust mass if needed.
10. Repeat until you have four specimens at 7.0 ± 0.5 % (6.5 - 7.5%) air voids.

4. HAMBURG WHEEL TRACKER PROCEDURE / SET-UP

The HWT testing of HMA specimens shall be performed according to AASHTO T 324 and the equipment manufacturer's instructions unless otherwise addressed in this section. The following procedure shall be used for HWT testing:

1. Place the HDPE molds (height of 60 mm) containing the specimens into the mounting trays. Adjust the height of the specimen tray as recommended by the manufacturer, and secure by hand-tightening the bolts.
2. The test temperature shall be 45°C unless otherwise noted by specification or request. Condition specimens for 45 minutes after achieving test temperature. At no time should specimens be submerged longer than 60 minutes prior to test initiation. NOTE: For HWT tests conducted using an Instrotek SmarTracker, the water bath should be brought to the test temperature prior to inserting the molds containing the specimens.
3. Lower wheel onto specimens
4. Set the equipment to shut off after 20,000 passes or when the maximum LVDT displacement is 18 mm. Set the equipment to record the LVDT displacement at the following sensor locations along the specimen: -114, -91, -69, -46, -23, 0, +23, +46, +69, +91, and +114 mm. Set the data acquisition to record deformation information at each of the eleven locations at every two passes.

5. REPORTING

The HWT report of results must include the following for each set of specimens (each side of the HWT machine):

- HMA production (field or lab)
- Compaction method (slab or SGC)
- Number of passes to failure
- Maximum impression (across all sensor locations)
- Test temperature
- Specimen(s) air voids
- Type and amount of anti-strip or additive (if used)
- Creep slope (in mm/1,000 passes)
- Strip slope (in mm/1,000 passes)
- Stripping inflection point (SIP)

HWT reports for the purpose of mix design approval and verification shall combine the data from the left and right side of the HWT machine to create one deformation curve. The maximum deformation for each side will be determined at each pass count and then averaged with the maximum deformation value from the opposite side value at the same pass count. In addition, the maximum difference between the deformation curves for each side of the HWT machine shall be reported. The following measures will be reported for the combined deformation curve and represent the final values for the mix design approval and verification sample:

- Number of passes to failure
- Maximum impression (across all sensor locations)
- Creep slope (in mm/1,000 passes)
- Strip slope (in mm/1,000 passes)
- Stripping inflection point

The HWT test will be deemed inconclusive if all of the following conditions are met:

1. The maximum deformation difference between the two sets of specimens (from each side of the HWT machine) exceeds 6 mm and,
2. According to the applicable specification for the mix design, one set of specimens is deemed passing and one set of specimens is deemed failing when they are analyzed individually (by either passes to failure or SIP).

If a HWT production verification or acceptance sample is deemed inconclusive, a replacement sample will be obtained immediately. If the initial sample was provided by the Contractor for mix design approval, a secondary set of material can be used for the re-test or additional material will be provided by the Contractor. If the initial sample was from field production operations, the re-test will be performed on an available dispute split from an existing Acceptance sample.

Stripping Inflection Point

The most current version of the MaineDOT HWT spreadsheet will be used to determine the stripping inflection point (SIP). The maximum deformation across the five middle sensor locations is determined at each pass count and used for SIP analysis and determination. The maximum deformation curve is characterized by a 6th degree polynomial determined through least-squares multiple regression.

The first 1,500 passes of the test are assumed to contain the consolidation phase of the test. The creep slope represents the rate of rutting in the linear region of the deformation curve prior to the onset of tertiary flow. The stripping slope is the rate of rutting in the linear region of the post tertiary deformation curve to the end of the test. The stripping inflection point (SIP) is the point of intersection of these two slopes.

Stripping Slope:
The stripping slope is calculated prior to the creep slope. First, the maximum rutting slope (absolute value) from the midpoint of the test in terms of passes to failure is identified. This is accomplished by finding the pass number at which the first derivative of the deformation curve is the largest. The slope of the curve is then evaluated at this pass number to give the stripping slope and then stripping slope intercept is then found using point slope form.

Creep Slope:
To calculate the creep slope, the pass at which the absolute value of the rutting slope is the smallest prior to the strip pass is first found (the consolidation phase is not considered in this analysis). This is accomplished by finding the pass (creep pass) at which the second derivative is zero (prior to the strip pass). The slope of the deformation curve is then evaluated at the creep pass over a 2,000 pass interval, resulting in the creep slope. NOTE: the creep pass is identified from the modelled regression curve and the creep slope is calculated from the raw maximum deformation measurements.

SIP:
The intersection of the creep slope and the stripping slope is found mathematically setting the equations for both lines equal and solving for the pass number. If any of the following conditions are met, the SIP will be considered invalid and reported as “N/A”:

- The regression model has an R^2 less than or equal to 0.95
- The ratio between the stripping slope and the creep slope is less than 3.0
- The stripping slope is less than 0.63 mm/1,000 passes

MaineDOT Policy

HMA Quality Control Communication Matrix

January 31, 2025

Below is a list of typical issues in HMA quality control that requires communication between the Contractor and the Department. The following sheet shall provide guidance as to who should be included in email distribution on these items.

Issue:	Communication Tree (primary recipient(s) bolded):
Initial Project submittals (Site specific QC plan, density random numbers, and mix designs)	**Resident**, PM1, CS, PQM, PQE
Control chart corrective action letter QC density quality level cease letter QA payfactor cease / reject letter	**Resident**, PM1, CS, PQM, PQE, QAE, PI
QCP update letter	**Resident**, PM1, CS, PQM, PQE, PI
Sampling method / core location dispute letter	**PQM**, **QAE**, Resident, PQE
QA dispute letter	**QAE**, LTE, Resident
Hamburg testing data	, **APME**, LTE, Resident
Mix design submittals / inquiries	**APME,** LTE
Mix design aim change	**APME**, LTE, Resident
PGAB change	**APME**, LTE, Resident, PI
Additive usage request	**PQM**, PQE, LTE, APME
RAP Submittal	**APME**, LTE
RAP Corrective Action	**APME**, LTE, PQM, PQE, PI
Consensus Quality Corrective Action	**APME**, LTE, PQM, PQE, Resident, PM1, PI, CS

Position	Name	Program/Region	Email Address:
Pavement Quality Manager (PQM)	Brian Luce	Statewide	brian.luce@maine.gov
Pavement Quality Engineer (PQE)	Tim Kelley	Statewide	timothy.a.kelley@maine.gov
QA Engineer (QAE)	Kevin Cummings	Statewide	kevin.cummings@maine.gov
Non-Destructive Testing Supervisor (NDTS)	Ryan Vose	Statewide	Ryan.k.vose@maine.gov
Assistant Pavement Materials Engineer (APME)	William (Bill) Kelly	Statewide	MaineDOT-PME@maine.gov
Laboratory Testing Engineer (LTE)	James (Ryan) Robinson	Statewide	james.r.robinson@maine.gov
Construction Support (CS)	Devin Anderson Travis Hamel Eric Shepherd Tom Stevens Shawn Smith Scott Bickford Mackenzie Kersbergen	Bridge Program Bridge Program Bridge Program Multimodal Highway Program Regional Program Regional Program	devin.anderson@maine.gov travis.w.hamel@maine.gov eric.shepherd@maine.gov thomas.stevens@maine.gov shawn.smith@maine.gov scott.bickford@maine.gov mackenzie.a.kersbergen@maine.gov
Project Manager 1 (PM1)	Ihsan Rbeat Matt Gallagher Kyle MacDonald Mark Shibles Vacant Ryan Sullivan	Southern Region Southern Region Mid-Coast Region Western Region Eastern Region Northern Region	ihsan.rbeat@maine.gov matthew.gallagher@maine.gov kyle.macdonald@maine.gov mark.shibles@maine.gov @maine.gov ryan.sullivan@maine.gov
Plant Inspector (PI)	Dana Knowles Mark Hyland Vacant Nick Heille Jason Orcutt Spencer Maynard	Southern Region Southern Region Southern Region Northern Region Northern Region Northern Region	dana.c.knowles@maine.gov mark.c.hyland@maine.gov Vacant nicholas.j.heille@maine.gov jason.l.orcutt@maine.gov spencer.maynard@maine.gov