



**Improving HMA, Bullfrog – May 8, 2015
Meeting Minutes**

Present	Name	Company	Present	Name	Company	Present	Name	Company
	Bell, Dave	Lakeside	X	Dempsey, Bill	Lakeside		Mathis, Jerome	Inland Asphalt
	Brickey, Bill	Granite	X	DeVol, Joe	WSDOT		McDuffee, Steve	Watson
X	Byrd, Andrew	WSDOT	X	Dyer, Bob	WSDOT		Morgan, TJ	Inland Asphalt
X	Cantrell, Logan	Granite	X	Ellis, Susan	FHWA	X	Pederson, Chris	CTL
X	Carpenter, Jeff	WSDOT	X	Erickson, Dave	WSDOT	X	Schneider, Glenn	WSDOT
X	Chapman, Josh	Granite	X	Gent, David	WAPA	X	Shearer, Tim	ICON
	Clayton, E. J.	Granite	X	Gribner, Mike	WSDOT	X	Uhlmeier, Jeff	WSDOT
	Costello, Mike	Pyramid		Hill, Kentin	Granite	X	Williams, Kurt	WSDOT

OLD BUSINESS

12-01 Streamline WMA certification paperwork

- October 26, 2012 - TJ Morgan requested WSDOT consider. Bob Dyer agreed to follow up.
- May 8, 2015, 2015 – No action.

13-02 Proposal to eliminate anti-strip in temp HMA

- November 8, 2013 – Topic first discussed
- May 9, 2014 – Dave Erickson agreed to draft a spec.
- October 9, 2014 – Dave Erickson provided a draft spec. (See Attachment #0). All present seemed to support proceeding with the change.
- May 8, 2015 - Dave Erickson reports the spec is done and will be published in the August 2015 Amendments. Item closed.

13-07 High RAP/RAS

- May 9, 2013 – Industry expressed concerns of not enough room for stockpiles
- May 9, 2014 - RAP subcommittee reported that we are currently waiting for the industry members of the subcommittee to develop a draft spec for review and discussion. Primary points of discussion have been (a) timing and extent of additional testing currently required when the amount of RAP exceeds 20% or any amount of RAS, and (b) determining the type and timing of testing of RAP and RAS in stockpile needed to make prudent decisions on how variations affect the service life of the end product.
- October 9, 2014 – Update – This subcommittee is looking at increasing the threshold for not requiring the RAP oil to be blended into the mix design for approval, from its present 20%, to 30%. In order to make sure this is a decision that will not jeopardize length of service life, the committee is looking for Washington State test data to support the increase.
- May 8, 2015 – Dave Gent provided a copy (See Attachment #1) of the letter sent to WSDOT summarizing his understanding of the agreement in principle, between WSDOT and WAPA folks on the RAP Subcommittee, which creates a new RAP category for binder bumping in lieu of blending, for RAP between 20% and 25%. It was agreed that the goal is to finalize this into a spec to be published in the January 2016 Amendments.

13-10 Use of hopper weights for scale checks in lieu of current process.

- May 9, 2013 – Topic raised by industry. Concept is to develop a proposal for use on “far away” projects
- May 8, 2015 – No action.

14-04 QPL Mix Designs

- May 9, 2014 - Kurt explained that WSDOT is working on putting approved mix designs on the QPL. This will mean that mix designs are good for two years instead of one. Industry members seemed to support this idea.
- October 9, 2014 – Kurt Williams reported that he will have a draft spec out by the end of October.
- May 8, 2015 – Kurt Williams reported this new spec was published in the April 2015 Amendments (See Attachment #2). Kurt said call the Lab if there are questions or concerns with applying the new process. Item closed.

14-06 Reference Mix Designs

- May 9, 2014 - Joe DeVol will develop a draft spec change that will give WSDOT the ability to stop or reject the use of reference mix designs when production data (from another project) shows it is not meeting specification.
- May 8, 2015 – Joe DeVol reported this new spec was published in the April 2015 Amendments. Item closed.

14-08 Draft spec to allow temp HMA to be commercial

- October 9, 2014 – This item was introduced.
- May 8, 2015 – The Standard Specs already allow temporary HMA to be accepted by Commercial Evaluation. Item closed.

14-10 Eliminate scaleman's daily report on small quantity jobs.

- May 9, 2014 – Initiated by Dave Bell
- October 9, 2014 – Dave Bell reported that he is working on a draft spec.
- May 8, 2015 – No action.

14-11 HMA on Bridges – Grinding, surveying, profile, density – update

- October 9, 2014 - Dave Erickson reported that the spec is being re-written, and he will distribute to industry for comment.
- May 8, 2015 – No action.

14-12 Pavement smoothness spec (IRI) changes for HMA

- October 9, 2014 – a draft of a proposed, revised spec was provided (attachment #3) for industry review and comment. Industry feedback is that the report, in the past, should better identify exactly where problem spots are – reference markings on the roadway are usually gone, and so they need help in interpreting the location data.
- May 8, 2015 – Dave Gent and Jeff Uhlmeier reported the table for incentive/disincentive for pavement smoothness was expanded to include IRI from 95 to 125 per 0.10 mile with the January 2015 amendments. Item closed.

14-13 Fine Aggregate Angularity (FAA) aka Uncompacted Void Content

- October 9, 2014 – Bob Dyer reported he is evaluating the enforcement of this spec on projects back to the 2010 spec book, but not done yet. Several contractors expressed that this test is weighted too high in the statistical evaluation and suggested that WSDOT reduce its relative importance in the future, that the test is not very reproducible, and that there is no mechanism to challenge the WSDOT test results. WSDOT responded that it is part of superpave.
- May 8, 2015 – Continued discussion, led by Dave Gent. Agreed that WAPA would develop a proposal for revisions to the spec.

14-16 Concerns with SAM

- October 9, 2014 - Dave Gent noted that SAM set-up is often cumbersome. He also suggested adding a “time stamp” for when documentation is entered (not shown currently) & add an “auto-notification” for producers / pavers (whether GC or sub.) to allow for timely review in case of challenges. Kurt Williams agreed to follow up.
- May 8, 2015 – Update from Kurt Williams. The lab has added a portal to SAM for all to use. A new field will be added to the database to record when each test data is input into SAM. “Auto-notification” to the contractor when data in SAM has been updated is in the process of being created, but has not happened yet. (MATS already has the ability to “auto-send”.)

NEW BUSINESS

15-00 Trackless Tack

- May 8, 2015 – Andrew Byrd reported that SC Region has a project this summer (ad date in a few weeks) that will require the use of paving grade asphalt for tack; they have proposed to allow trackless tack as an option. Jeff Uhlmeier asked if WAPA had any concerns over two types of tack in one project, such that trackless tack could be used as an experimental feature?

15-01 Increasing RAP % in aggregates

- May 8, 2015 – (i.e., using RAP in stuff other than HMA, i.e. discuss updating (9-03.21(1) E table) – Dave Gent brought up this item, and said the RAP subcommittee will take up this issue. Need to look at 9-03.21 to consider increasing RAP percent. A concern was noted that using RAP in untreated aggregates creates difficulties with measuring compaction with a nuke gage, which will need to be overcome.

15-02 HMA Spec Improvements Phase 1

- May 8, 2015 – Rewriting 5-04 to make it easier to understand – Bob Dyer

- A Jeff Carpenter initiative
- Strategies incorporated in draft (draft will be emailed out a few days before the May 8 meeting)
 - Move Warm Mix to its own section 5-04A
 - Move Commercial to its own Section 5-04B
 - Move non-statistical acceptance into its own section 5-04C
 - Reorganize 5-04 so that subheadings are logical subcategories of the headings
 - Take a shot at active voice imperative mood
- Desired Milestones
 - May 6, 2015 Distribute Draft to Regions and WAPA
 - May 8, 2015 Early Feedback at Improving HMA meeting
 - May 22, 2015 Deadline for Feedback
 - June 12, 2015 Submit to FHWA for Approval
 - June 30, 2015 Send to printer to solicit bids
 - August 2015 – DO NOT include the new spec in the August 2015 Amendments
 - January 1, 2016 New Spec printed in 2016 Spec Book
 - January 1, 2016 Clean Up problems in the 2016 Amendments to Std Spec

15-03 HMA Spec Improvements – Phase 2

- May 8, 2015 – Making changes to the HMA specs to move into the 21st century – Bob Dyer
 - The stuff we have been working on
 - Ensure quality at lowest cost to taxpayers
 - Look at worthy state of the art best practices
 - Move WSDOT to more performance/ after the fact testing
 - Increase QC/QA responsibility on to the Contractor

NEXT MEETING – October 9, 2015



Attach #1

From: Dave Gent - WAPA [redacted]
Sent: Tuesday, April 21, 2015 11:36 AM
To: 'DeVol, Joe'; 'Kurt Williams, P.E. ([redacted])'; 'Kentin Hill - Granite Construction'; 'tim.shearer@oldcastlematerials.com'; 'Dave Bell'; 'Bill Dempsey'
Subject: RAP Subcommittee Agreement Outline

This is what I think we agreed to in rough form:

- RAP Spec. from zero to 20% stays as it is for the time being.
- RAP will be allowed from 20 to 25% with a simple binder bump (both ends). For example, for the Westside, PG 64-22 designs would use PG 58-28 binder and, for the Eastside, PG 64-28 designs would use PG 58-34 binder for RAP from 20 to 25%
- To propose the use of 20 to 25% RAP, the Contractor is required to test and report binder characterization for every 5,000 tons of RAP produced in order to create a database of RAP binder variation.
- A double upper bump to PG 52-28 for use on PG 64-22 projects is conceptually allowable with the caveat that the RAP characterization tests provided show that the blending chart value of the binder is not below PG 58 grade (i.e. the final blended binder is not too soft).
- The existing "high RAP" GSP will be used for mixes with RAP above 25% or with any RAS.

With better information on RAP characterization, follow-up specification evolution items will include:

- Decision on whether the "binder bump" process can be reliably moved to RAP at 30%.
- WSDOT and WAPA will review the high RAP GSP to see if using the intermediate binder grade is a more effective predictor of fatigue than limiting the upper binder grade. Look to move more in line with M320 guidelines.
- Evaluate whether it is really necessary to bump the low end binder grade in the binder bump protocol at 25% or 30% RAP usage levels (i.e. is bumping only the high end grade sufficient and at what level of RAP).

Please "Reply to all" if you would like to add to or alter these notes so that WSDOT can sketch out an agreement outline for group discussion at our next full committee meeting on May 8th at Bullfrog.

Thank you all for your time and involvement in this process. I think we've got a reasonable path forward for all concerned.

Dave Gent

David Gent, P.E.
Technical Director
Washington Asphalt Pavement Assoc. (WAPA)
(253) 261-4486 * Fax (206) 428-7199

www.wapa.org

Attach #2

Mix designs with 20 percent RAP or less by total weight of HMA and no RAS will be completed without the inclusion of the RAP. For HMA mix designs with greater than 20 percent RAP by total weight of HMA or any amount of RAS the Contractor shall develop a mix design including RAP, RAS, recycling agent and new asphalt binder. Asphalt binder contributed from RAS shall be determined in accordance with AASHTO PP 78. The total quantity of asphalt binder from the RAP and RAS shall not exceed 40 percent of the total asphalt binder content of the HMA.

Once the RAP and RAS stockpiles have been constructed the Contractor shall extract, recover and test the asphalt residue from the RAP and RAS stockpiles to determine the percent of recycling agent and/or grade of new asphalt binder needed to meet the grade of asphalt binder required by the contract. The asphalt extraction testing shall be performed in accordance with AASHTO T 164 or ASTM D 2172 using reagent grade trichloroethylene. The asphalt recovery shall be performed in accordance with AASHTO R 59 or ASTM D 1856. The recovered asphalt residue shall be tested in accordance with AASHTO R 29 to determine the asphalt binder grade in accordance with Section 9-02.1(4). Once the recovered asphalt binder grade is determined the percent of recycling agent and/or grade of new asphalt binder shall be determined in accordance with ASTM D 4887. The final blend of recycling agent, recovered and new asphalt shall be tested in accordance with AASHTO R 29 to confirm that it meets the grade of asphalt binder required by the contract in accordance with Section 9-02.1(4). All recovered and blended asphalt binder test data shall be reported to the Contracting Agency prior to submitting the mix design for approval on the OPL.

5-04.3(7)A2 Statistical or Nonstatistical Evaluation

Mix designs for HMA accepted by statistical and nonstatistical evaluation shall be submitted to the Project Engineer on WSDOT Form 350-042. For a mix design that was originally developed for another WSDOT contract, the Contractor shall also submit WSDOT Form 350-041 and include all changes to the job mix formula that have been approved on other contracts:

The Contractor shall submit representative samples of the mineral materials that are to be used in the HMA production. The Contracting Agency will use these samples to evaluate the mix design in accordance with WSDOT FOP for AASHTO T 324 and WSDOT FOP for ASTM D 6931. Evaluation of HMA mix designs proposed by the Contractor that include RAP will be completed without the inclusion of the RAP. Submittal of RAP samples is not required. A mix design evaluation report will be provided within 25 calendar days after a mix design submittal has been received in the State Materials Laboratory in Tumwater. No paving shall begin prior to issuance of the mix design evaluation report or reference mix design evaluation report for that year.

The Contractor shall submit WSDOT Form 350-041EF to the Engineer for approval to use a mix design from the OPL. The Contractor may include changes to the job mix formula that have been approved on other contracts. The request to use a mix design from the OPL may be rejected if production of the HMA from another contract is not in compliance with Section 5-04.3(11)D.

The Contractor shall submit representative samples of the materials that are to be used in the HMA production to the State Materials Laboratory in Tumwater. For HMA mix designs with 20 percent RAP or less by total weight of HMA and no RAS, the Contractor shall submit representative samples of the mineral materials that are to be used in the HMA production; the submittal of RAP samples is not required for these mix designs. For HMA mix designs with greater than 20 percent RAP by total weight of HMA or any amount of RAS the Contractor shall submit representative samples of the mineral materials, RAP, RAS and 100 grams of recovered asphalt residue from the RAP and RAS that are to be used in the HMA production. The Contracting Agency will use these samples to evaluate the mix design for approval on the OPL in accordance with WSDOT Standard Practice OC-8.

IMPROVING HMA

May 8, 2015

GLENN SCHNEIDER	WSDOT
Susan Ellis	FHWA
Kurt Williams	WSDOT
ANDREW BYRD	WSDOT
DAVE ERICSON	WSDOT
Jeff Uhlmeier	WSDOT
Josh Chapman	Granite
Logan Cantrell	Granite
Joe DeVol	WSDOT
JEFF CARPENTER	WSDOT
MIKE GRIBNER	WSDOT
Chris Federsen	CTL
Gerome Mathis	Inland Asphalt
BILL DEMPSEY	LAKESIDE
TIM SHEARER	ICOW Materials
David Gent	WAPA
Bob Dyer	WSDOT



Improving HMA, Bullfrog – October 9, 2015

Meeting Minutes

Present	Name	Company	Present	Name	Company	Present	Name	Company
X	Bell, Dave	Lakeside		Dempsey, Bill	Lakeside	X	Mathis, Jerome	Inland Asphalt
	Brickey, Bill	Granite	X	DeVol, Joe	WSDOT	X	McDuffee, Steve	Watson
	Byrd, Andrew	WSDOT	X	Dyer, Bob	WSDOT	X	Pederson, Chris	CTL
X	Cantrell, Logan	Granite		Ellis, Susan	FHWA		Schneider, Glenn	WSDOT
			X	Erickson, Dave	WSDOT		Shearer, Tim	ICON
X	Chapman, Josh	Granite	X	Gent, David	WAPA	X	Shippy, Ron	Inland Asphalt
X	Clayton, E. J.	Granite		Gribner, Mike	WSDOT	X	Uhlmeier, Jeff	WSDOT
X	Costello, Mike	Pyramid	X	Hill, Kentin	Granite	X	Williams, Kurt	WSDOT

OLD BUSINESS

12-01 Streamline WMA certification paperwork

- October 26, 2012 - TJ Morgan requested WSDOT consider. Bob Dyer agreed to follow up.
- May 8, 2015, 2015 – No action.
- October 9, 2015 – Very little or no warm mix used in last few years. A one-page submittal is all that is currently required and all present appeared to be aware of the written criteria WSDOT created several years ago. Bob Dyer will create a form that captures the info WSDOT needs so it can be referenced in the specs.

13-07 High RAP/RAS

- May 9, 2013 – Industry expressed concerns of not enough room for stockpiles
- May 9, 2014 - RAP subcommittee reported that we are currently waiting for the industry members of the subcommittee to develop a draft spec for review and discussion. Primary points of discussion have been (a) timing and extent of additional testing currently required when the amount of RAP exceeds 20% or any amount of RAS, and (b) determining the type and timing of testing of RAP and RAS in stockpile needed to make prudent decisions on how variations affect the service life of the end product.
- October 9, 2014 – Update – This subcommittee is looking at increasing the threshold for not requiring the RAP oil to be blended into the mix design for approval, from its present 20%, to 30%. In order to make sure this is a decision that will not jeopardize length of service life, the committee is looking for Washington State test data to support the increase.
- May 8, 2015 – Dave Gent provided a copy (See Attachment #1) of the letter sent to WSDOT summarizing his understanding of the agreement in principle, between WSDOT and WAPA folks on the RAP Subcommittee, which creates a new RAP category for binder bumping in lieu of blending, for RAP between 20% and 25%. It was agreed that the goal is to finalize this into a spec to be published in the January 2016 Amendments.
- October 9, 2015 – Update from Kurt Williams – We need to reconvene the subcommittee to work out a few details. Need more discussion on the proposed changes to RAP between 20% and 25%. Dave Gent and Kurt will get the RAP subcommittee going on this.

13-10 Use of hopper weights for scale checks in lieu of current process.

- May 9, 2013 – Topic raised by industry. Concept is to develop a proposal for use on “far away” projects
- May 8, 2015 – No action.
- October 9, 2015 – Update from Dave Gent – agreed to close this item for now.

14-10 Eliminate scaleman’s daily report on small quantity jobs.

- May 9, 2014 – Initiated by Dave Bell
- October 9, 2014 – Dave Bell reported that he is working on a draft spec.
- May 8, 2015 – No action.
- October 9, 2015 – Update from Dave Bell – would like a spec which deletes the requirement for the scaleman’s daily report for projects with less than 100 Tons of HMA. Dave agreed to close this item for now.

14-11 HMA on Bridges – Grinding, surveying, profile, density – update

- October 9, 2014 - Dave Erickson reported that the spec is being re-written, and he will distribute to industry for comment.
- May 8, 2015 – No action.

- October 9, 2015 – Update from Dave Erickson on history over the last 4 years. Mark Gaines is working on revising the spec. Industry reported that all grinders are not currently equipped with the equipment to control grinding depth to the extent needed to make all ride corrections with the grinder. Item closed until the spec is completed.

14-13 Fine Aggregate Angularity (FAA) aka Uncompacted Void Content

- October 9, 2014 – Bob Dyer reported he is evaluating the enforcement of this spec on projects back to the 2010 spec book, but not done yet. Several contractors expressed that this test is weighted too high in the statistical evaluation and suggested that WSDOT reduce its relative importance in the future, that the test is not very reproducible, and that there is no mechanism to challenge the WSDOT test results. WSDOT responded that it is part of superpave.
- May 8, 2015 – Continued discussion, led by Dave Gent. Agreed that WAPA would develop a proposal for revisions to the spec.
- October 9, 2015 – Update from Dave Gent, who handed out a draft proposal (attached) to change the spec. The key changes Dave is seeking are a) reduce the size of the financial disincentive, which industry believes is disproportionately high, b) an ability for the contractor to challenge the WSDOT test results, and c) a sliding scale for the severity of the out-of-specness. Other test methods were discussed. Finally agreed that Granite will do some computer experimentation on the effect on the CPF of changing the statistical parameters so that the mixture CPF includes the PF for SE, coarse fracture, and FAA, and report results by next meeting.

14-16 Concerns with SAM

- October 9, 2014 - Dave Gent noted that SAM set-up is often cumbersome. He also suggested adding a “time stamp” for when documentation is entered (not shown currently) & add an “auto-notification” for producers / pavers (whether GC or sub.) to allow for timely review in case of challenges. Kurt Williams agreed to follow up.
- May 8, 2015 – Update from Kurt Williams. The lab has added a portal to SAM for all to use. A new field will be added to the database to record when each test data is input into SAM. “Auto-notification” to the contractor when data in SAM has been updated is in the process of being created, but has not happened yet. (MATS already has the ability to “auto-send”.)
- October 9, 2015 – Update from Kurt Williams – MATS program has the ability to auto-email results to the contractor if the Paving contractor so requests the PE, but SAM does not. Bob Dyer agreed to modify Construction Manual to require PE to email MATS results when so requested by the contractor.

15-00 Trackless Tack

- May 8, 2015 – Andrew Byrd reported that SC Region has a project this summer (ad date in a few weeks) that will require the use of paving grade asphalt for tack; they have proposed to allow trackless tack as an option. Jeff Uhlmeier asked if WAPA had any concerns over two types of tack in one project, such that trackless tack could be used as an experimental feature?
- October 9, 2015 – Update from Dave Gent. We need a draft spec and a project to allow it experimentally. WSDOT agreed that Bob Dyer will revise the spec to allow STE-1 for tack because it was deleted from the 2014 Std Spec Book because we didn't think anyone was using it anymore, not because there is anything wrong with it.

15-01 Increasing RAP % in aggregates

- May 8, 2015 – (i.e., using RAP in stuff other than HMA, i.e. discuss updating (9-03.21(1) E table) – Dave Gent brought up this item, and said the RAP subcommittee will take up this issue. Need to look at 9-03.21 to consider increasing RAP percent. A concern was noted that using RAP in untreated aggregates creates difficulties with measuring compaction with a nuke gage, which will need to be overcome.
- October 9, 2015 – Update from Dave Gent – there is still some industry desire to pursue this issue, but the obstacle has been how to deal with nuke gauge density measurement difficulties created by the asphalt. Chris Pederson will put together data on how this has been handled by other states and get it to Dave Gent.

15-02 HMA Spec Improvements Phase 1

- May 8, 2015 – Rewriting 5-04 to make it easier to understand – Bob Dyer
 - A Jeff Carpenter initiative
 - Strategies incorporated in draft (draft will be emailed out a few days before the May 8 meeting)
 - Move Warm Mix to its own section 5-04A
 - Move Commercial to its own Section 5-04B
 - Move non-statistical acceptance into its own section 5-04C
 - Reorganize 5-04 so that subheadings are logical subcategories of the headings
 - Take a shot at active voice imperative mood

- Desired Milestones
 - May 6, 2015 Distribute Draft to Regions and WAPA
 - May 8, 2015 Early Feedback at Improving HMA meeting
 - May 22, 2015 Deadline for Feedback
 - June 12, 2015 Submit to FHWA for Approval
 - June 30, 2015 Send to printer to solicit bids
 - August 2015 – DO NOT include the new spec in the August 2015 Amendments
 - January 1, 2016 New Spec printed in 2016 Spec Book
 - January 1, 2016 Clean Up problems in the 2016 Amendments to Std Spec
- October 9, 2015 – The latest draft is attached. General discussion and a few questions. Bob Dyer needs comments (in writing) back by the end of October. The new spec did not meet the deadline for the 2016 spec book, so new target is to be an Amendment to the 2016 Std Spec, effective on Jan 1, 2016. Bob explained that a change that will be made to the attached draft is, for High RAP/Any RAS mixes, the blended grade of binder from RAP, RAS, virgin oil, etc, must meet the AASHTO M-320 requirements for the required PG grade, and no PG grade other than the required PG grade. Also attached is the new test procedure for running mixture tests when the sample is taken by coring.

NEW BUSINESS

15-04 Specs on dilution of tack

- October 9, 2015 – Bob Dyer- Is a table of tack rates needed? Dave Gent - Also really like the standard of thin film of residual rather than a target to be measured. A good tack coat is easy to recognize, but a hassle to measure. Continue educational efforts across the board. – This item was tabled without discussion owing to the full agenda.

15-05 Use of CSS-1h for tack

- October 9, 2015 – Dave E explained that he would like to see “h” used because it is less prone to wheel-tracking. Dave Gent agreed to check with the oil suppliers to make sure it is readily available. Joe DeVol will bring up the same issue at the oil suppliers meeting in January 2016. Further discussion tabled until availability from the suppliers is verified.

15-06 Review of the general requirements of recycled material in Section 9-03.21(1)

- October 9, 2015 – Dave E reported that he has heard that we may not be consistently applying the specifications for toxicity testing. Some PE’s ask for the test; some don’t; some contractors have the test data and some don’t. It was reported that the required testing is for lead leaching (and TCLP if lead fails), is required every 90 days, and cost \$250 for a round of tests. Industry asked why the testing can’t be eliminated because RAP is classified as non-hazardous. Kurt explained that the testing is an agreement WSDOT has made with DOE, and without obtaining DOE approval the testing must continue. Consensus was that the spec will not change and that HMA suppliers should see an increase in requests by WSDOT for copies of the test reports. Item closed.

15-07 The 3 months limit prior to submitting mix design approval to 6 months.

October 9, 2015 – Is this enough time? Kurt Williams agreed to consider increasing to something more than 3 months but needs time to do so.

15-08 Status on RAP/RAS Committee tentative agreement on 25% RAP with binder bumping

October 9, 2015 - Further discussion by the RAP subcommittee was agreed upon. Close this item and track under 13-07.

15-09 Optional allowance for submitting RAP with the zero to 20% RAP QPL mix designs

October 9, 2015 - Dave Gent - WAPA members would like this option to be allowed, if not in the specs., then by agreement with the Materials Lab. WSDOT agreed to Implement. Kurt and Joe agreed they would get it done.

15-10 Is WSDOT still evaluating/considering electro-magnetic asphalt density gauges.

October 9, 2015 Dave Gent - Many WAPA members would like to move to new style gauges and away from nuke gauges, but would like WSDOT’s current view. Steve McDuffee reported his experience has been that they are sensitive to hot HMA and provide more accurate results when pavement is cooled. WAPA reported that small local agencies don’t have nuke gages. Current WSDOT investment in nukes will make this a difficult change, particularly because even if there was established and accepted accuracy of the electric gages, they don’t yet work on soils so WSDOT would have to use both technologies.

15-11 Legislative Update – Laws Passed Spring 2015 Legislative Session

October 9, 2015 - Dave Erickson reported a) a there will be a new requirement on every contract for the prime contractor to report the amount of recycled concrete used on the project, or provide cost data if it didn't meet the new 25% recycled concrete requirement for those materials in the Table in Section 9-03.21. b) Prime will be soon be required, on every contract, to create a report every month on payments made and withheld to subs. c) Contractor will be required, on every Connecting Washington contract, to report dollars spent on peds, bicycles, and transit.

NEXT MEETING – Spring 2016 Date T.B.D.

5-04 Hot Mix Asphalt

This Section 5-04 is written in a style which, unless otherwise indicated, shall be interpreted as instruction or direction to the Contractor.

5-04.1 Description

This Work consists of providing and placing one or more layers of plant-mixed hot mix asphalt (HMA) on a prepared foundation or base, in accordance with these Specifications and the lines, grades, thicknesses, and typical cross-sections shown in the Plans. The manufacture of HMA may include warm mix asphalt (WMA) processes in accordance with these specifications.

HMA shall be composed of asphalt binder and mineral materials as required, and may include reclaimed asphalt pavement (RAP) or reclaimed asphalt shingles (RAS), mixed in the proportions specified to provide a homogeneous, stable, and workable mix.

5-04.2 Materials

Provide materials as specified in these sections:

Asphalt Binder	9-02.1(4)
Cationic Emulsified Asphalt	9-02.1(6)
Anti-Stripping Additive	9-02.4
Warm Mix Asphalt Additive	9-02.5
Aggregates	9-03.8
Reclaimed Asphalt Pavement (RAP)	9-03.8(3)B
Reclaimed Asphalt Shingles (RAS)	9-03.8(3)B
Mineral Filler	9-03.8(5)
Recycled Material	9-03.21
Hot Poured Sealant	9-04.2(1)A
Sand Slurry	9-04.2(1)B

5-04.2(1) How to Get a HMA Mix Design on the QPL

Comply with each of the following:

- Develop the mix design in accordance with WSDOT SOP 732.
- Develop a mix design that complies with Sections 9-03.8(2) and 9-03.8(6).
- Develop a mix design no more than 3 months prior to submitting it for QPL evaluation.
- Submit a mix design to the WSDOT State Materials Laboratory on WSDOT Form 350-042EF.
- Include representative samples of the materials that are to be used in the HMA production as part of the mix design submittal. See 5-04.2(1)A to determine when to include samples of RAP or RAS.
- Identify the brand, type and percentage of anti-stripping additive in the mix design submittal.
- Include with the mix design submittal a certification from the asphalt binder manufacturer that the anti-stripping additive is compatible with the crude source and the formulation of asphalt binder proposed in the mix design.
- The use or non-use of Warm Mix Additives (WMA) is not part of the process for obtaining approval for listing a mix design on the QPL. Refer to Section 5-04.2(2)B.

The Contracting Agency will evaluate the mix design in accordance with Table 1 for approval to be placed on the QPL.

Table 1
Basis for WSDOT Evaluation of HMA Mix Designs For Approval on the QPL

Contractual Basis of Acceptance of HMA Mixture [see Section 5-04.3(9)]	Basis for Contracting Agency Approval of Mix Design for QPL	Contracting Agency Materials Testing for Evaluation of the Mix Design
Statistical Evaluation, or Nonstatistical Evaluation	WSDOT Standard Practice QC-8	WSDOT will test the mix design materials for compliance with Sections 9-03.8(2) and 9-03.8(6).
Visual Evaluation	WSDOT Standard Practice QC-8	The Contracting Agency may elect to test the mix design materials, at its sole discretion.

If WSDOT approves the mix design, it will be listed on the QPL for 12 consecutive months. WSDOT may extend the 12 month listing provided the Contractor submits a certification letter to the Qualified Products Engineer verifying that the aggregate source and JMF gradation, and asphalt binder crude source and formulation have not changed. The Contractor may submit the certification no sooner than one month prior to expiration of the initial 12 month mix design approval. Within 7 calendar days of receipt of the Contractor's certification WSDOT will update the QPL. The maximum duration for approval of a mix design and listing on the QPL will be 24 months from the date of initial approval or as approved by the Engineer.

5-04.2(1)A Mix Designs Containing RAP and/or RAS

Mix designs are classified by the RAP and/or RAS content as shown in Table 2.

Table 2
Mix Design Classification Based on RAP/RAS Content

RAP/RAS Classification	RAP/RAS Content ^(note 1)
Low RAP/No RAS	$0\% \leq \text{RAP}\% \leq 20\%$ and $\text{RAS}\% = 0\%$
High RAP/Any RAS	$20\% < \text{RAP}\% \leq \text{Maximum Allowable RAP}$ ^(note 2) and/or $0\% < \text{RAS} \leq \text{Maximum Allowable RAS}$ ^(note 2)

Note 1: Percentages in this table are by total weight of HMA

Note 2: See Table 5 to determine the limits on the maximum amount RAP and/or RAS.

5-04.2(1)A1 Low RAP/No RAS – Mix Design Submittals for Placement on QPL

For Low RAP/No RAS mixes, comply with the submittal requirements of Section 5-04.2(1) and the following:

1. Develop the mix design without the inclusion of RAP.
2. The asphalt binder grade shall be the grade indicated in the bid item name or as otherwise required by the contract.
3. Do not submit samples of RAP with these mix designs.
4. Testing RAP or RAS stockpiles is not required for placing these mix designs on the QPL.

5-04.2(1)A2 High RAP/Any RAS - Mix Design Submittals for Placement on QPL

For High RAP/Any RAS mixes, comply with the requirements of Section 5-04.2(1)

and all of the following that apply:

1. For mixes with any RAS, test the RAS stockpile (and RAP stockpile if any RAP is in the mix) in accordance with Table 4.
2. For mixes with no RAS, test the RAP stockpile in accordance with Table 4.
3. For mixes with High RAP/Any RAS, complete constructing a single stockpile for RAP and a single stockpile for RAS and isolate these stockpiles from further stockpiling before beginning development of the mix design. Test the RAP and RAS stockpile during their construction as required by item 1) or 2) above. Use the test data in developing the mix design, and report the test data to WSDOT as part of the mix design submittal for approval on the QPL. Do not add to these stockpiles after starting the mix design process.
4. Comply with 5-04.3(5)A for stockpiling RAP and/or RAS after sequestering the RAP/RAS stockpiles for mix design approval on the QPL.

Table 4

Test Frequency of RAP and RAS During RAP and RAS Stockpile Construction For the Purpose of Approving a Mix Design for Placement in the QPL

Test Frequency	Test for	Test method
<ul style="list-style-type: none"> • 1/1000 tons of RAP (minimum of 10 per mix design) and • 1/100 tons of RAS (minimum of 10 per mix design) 	Asphalt Binder content	FOP for AASHTO T 308
	Aggregate Gradation	FOP for WAQTC T 27/T 11

5. Limit the amount of RAP and/or RAS used in a High RAP/Any RAS mix design by the amount of binder contributed by the RAP and/or RAS, in accordance with Table 5.

Table 5

Maximum Amount of RAP and/or RAS in HMA Mixture

Maximum Amount Asphalt Binder Contributed from:	
RAP	RAS
40% ^(note 1) minus contribution of binder from RAS	20% ^(note 2)

Note 1: Calculated as the weight of asphalt binder contributed from the RAP as a percentage of the total weight of asphalt binder in the mix.

Note 2: Calculated as the weight of asphalt binder contributed from the RAS as a percentage of the total weight of asphalt binder in the mix.

6. Develop the mix design including RAP, RAS, recycling agent, and new binder.
7. Perform asphalt recoveries on the RAP and RAS in accordance with AASHTO R 59 or ASTM D 1856. Include 100 grams of recovered asphalt residue from the RAP and RAS that are to be used in the HMA production when submitting the mix design for approval on the QPL
8. Ensure that the mix design provides a final blend of recycling agent, binder recovered from RAP and/or RAS, and new asphalt binder which meets the grade required by the contract and the requirements of Section 9-02.1(4).

5-04.2(1)B Mix Design Submittal for Placement on QPL - Commercial HMA

For HMA used in the bid item Commercial HMA, in addition to the requirements of 5-04.2(1) identify the following in the submittal:

1. Commercial HMA
2. Class, base grade of binder
3. ESAL design level

The Contracting Agency may elect to approve Commercial HMA mix designs without evaluation.

5-04.2(1)C Mix Design Resubmittal for QPL Approval

Develop a new mix design and resubmit for approval on the QPL when any of the following changes occur. When these occur, do not use such mixes before they are reapproved on the QPL.

1. Change in the source of crude petroleum used in the asphalt binder.
2. Changes in the asphalt binder refining process.
3. Changes in additives or modifiers in the asphalt binder.
4. Changes in the anti-strip additive, brand, type or quantity.
5. Changes to the source of material for aggregate.
6. Changes to the job mix formula that exceed the amounts as described in item 2 of Section 9-03.8(7), unless otherwise approved by the Engineer.
7. Changes in the percentage of material from a stockpile, when such changes exceed 5% of the total aggregate weight.
 - a) Changes to the percentage of material from a stockpile will be calculated based on the total aggregate weight (not including the weight of RAP) for Low RAP/No RAS mixes.
 - b) For High RAP/Any RAS mixes, changes in the percentage of material from a stockpile will be based on total aggregate weight including the weight of RAP (and/or RAS when included in the mixture).

Prior to making any change in the amount of RAS from that in the approved mix design, notify the Engineer for determination of whether a new mix design is required, and obtain the Engineer's approval prior to implementing such changes.

5-04.2(2) Mix Design – Obtaining Project Approval

Use only mix designs listed on the Qualified Products List (QPL). Submit WSDOT Form 350-041EF to the Engineer to request approval to use a mix design from the QPL. Changes to the job mix formula (JMF) that have been approved on other contracts may be included. The Engineer may reject a request to use a mix design if production of HMA using that mix design on another contract is not in compliance with Section 5-04.3(11)D, E, F, G, and H.

5-04.2(2)A Changes to the Job Mix Formula

The approved mix design obtained from the QPL will be considered the starting JMF and shall be used as the initial basis for acceptance of HMA mixture, as detailed in Section 5-04.3(9).

During production the Contractor may request to adjust the JMF. Any adjustments to the JMF will require approval of the Engineer and shall be made in accordance with Section 9-03.8(7). After approval by the Engineer, such adjusted JMF's shall constitute the basis for acceptance of the HMA mixture.

5-04.2(2)B Using Warm Mix Asphalt Processes

The Contractor may, at the Contractor’s discretion, elect to use warm mix asphalt (WMA) processes for producing HMA. Warm Mix processes include organic additives, chemical additives, and foaming. The use of WMA is subject to the following:

- Do not use WMA processes in the production of High RAP/Any RAS mixtures.
- Submit to the Engineer for approval Form #XXXX to describe the WMA process that is proposed.

5-04.3 Construction Requirements

5-04.3(1) Weather Limitations

Do not place HMA for wearing course on any Traveled Way, beginning October 1st through March 31st of the following year, without written approval from the Engineer.

Do not place HMA on any wet surface, or when the average surface temperatures are less than those specified in Table 6, or when weather conditions otherwise prevent the proper handling or finishing of the HMA.

**Table 6
Minimum Surface Temperature for Paving**

Compacted Thickness (Feet)	Wearing Course	Other Courses
Less than 0.10	55°F	45°F
0.10 to 0.20	45°F	35°F
More than 0.20	35°F	35°F

5-04.3(2) Paving Under Traffic

These requirements apply when the Roadway being paved is open to traffic.

In hot weather, the Engineer may require the application of water to the pavement to accelerate the finish rolling of the pavement and to shorten the time required before reopening to traffic.

During paving operations, maintain temporary pavement markings throughout the project. Install temporary pavement markings on the Roadway prior to opening to traffic. Temporary pavement markings shall comply with Section 8-23.

5-04.3(3) Equipment

5-04.3(3)A Mixing Plant

Equip mixing plants with the following items:

1. Tanks for storage and preparation of asphalt binder shall:

- Heat the contents by means that do not allow flame to contact the contents or the tank, such as by steam or electricity.
- Heat and hold contents at the required temperatures.
- Continuously circulate contents to provide uniform temperature and consistency during the operating period.
- Provide an asphalt binder sampling valve, in either the storage tank or the supply line to the mixer.

2. Thermometric equipment shall be:

- In the asphalt binder feed line near the charging valve at the mixer unit, capable of detecting temperature ranges expected in the HMA and in a location convenient and safe for access by Inspectors.
 - At the discharge chute of the drier to automatically register or indicate the temperature of the heated aggregates, and situated in full view of the plant operator.
3. **Heating of asphalt binder shall:**
- Not exceed the maximum temperature of the asphalt binder recommended by the asphalt binder manufacturer;
 - Avoid local variations in heating.
 - Provide a continuous supply of asphalt binder to the mixer at a uniform average temperature with no individual variations exceeding 25°F.
 - Not exceed the maximum temperature recommended by the manufacturer of WMA additive when a WMA additive is included in the asphalt binder.
4. **A mechanical sampler for sampling mineral materials shall:**
- Meet the requirements of Section 1-05.6.
5. **Equipment for sampling HMA shall:**
- Be platforms or devices to enable sampling from the hauling vehicle without entering the hauling vehicle.
6. **Space for field testing shall:**
- Be as required in Section 3-01.2(2).
7. **HMA Plant Screens or Lump Breaker**
- When using RAP or RAS, equip the mixing plant with screens or a lump breaker to eliminate oversize RAP or RAS particles from entering the plant.

5-04.3(3)B Hauling Equipment

Provide HMA hauling equipment with tight, clean, smooth metal beds and a cover of canvas or other suitable material of sufficient size to protect the mix from adverse weather. Securely attach the cover to protect the HMA whenever the weather conditions during the work shift include, or are forecast to include, precipitation or an air temperature less than 45°F.

Prevent HMA mixture from adhering to the hauling equipment. Spray metal beds with an environmentally benign release agent. Drain excess release agent prior to filling hauling equipment with HMA. Do not use petroleum derivatives or other coating material that contaminate or alter the characteristics of the HMA. For hopper trucks, operate the conveyer during the process of applying the release agent.

5-04.3(3)C Pavers

Use self-contained, power-propelled pavers provided with an internally heated vibratory screed, and capable of spreading and finishing courses of HMA plant mix material in lane widths required by the paving section shown in the Plans.

When requested by the Engineer, provide written certification that the paver is equipped with the most current equipment available from the manufacturer for the prevention of segregation of the coarse aggregate particles. The certification shall list the make, model, and year of the paver and any equipment that has been retrofitted to the paver.

Operate the screed in accordance with the manufacturer's recommendations and in a manner to produce a finished surface of the required evenness and texture without

tearing, shoving, segregating, or gouging the mix. Provide a copy of the manufacturer's recommendations upon request by the Contracting Agency. Extensions to the screed will be allowed provided they produce the same results, including ride, density, and surface texture as obtained by the primary screed. In the Travelled Way do not use extensions without both augers and an internally heated vibratory screed.

Equip the paver with automatic screed controls and sensors for either or both sides of the paver. The controls shall be capable of sensing grade from an outside reference line, sensing the transverse slope of the screed, and providing automatic signals that operate the screed to maintain the desired grade and transverse slope. Construct the sensor so it will operate from a reference line or a mat referencing device. The transverse slope controller shall be capable of maintaining the screed at the desired slope within plus or minus 0.1 percent.

Equip the paver with automatic feeder controls, properly adjusted to maintain a uniform depth of material ahead of the screed.

Manual operation of the screed is permitted in the construction of irregularly shaped and minor areas. These areas include, but are not limited to, gore areas, road approaches, tapers and left-turn channelizations.

When specified in the Contract, provide reference lines for vertical control. Place reference lines on both outer edges of the Traveled Way of each Roadway. Horizontal control utilizing the reference line is permitted. Use reference lines to automatically control the grade and slope for intermediate lanes or by means of a mat referencing device and a slope control device. When the finish of the grade prepared for paving is superior to the established tolerances and when, in the opinion of the Engineer, further improvement to the line, grade, cross-section, and smoothness can best be achieved without the use of the reference line, a mat referencing device may be substituted for the reference line. Substitution of the device will be subject to the continued approval of the Engineer. A joint matcher may be used subject to the approval of the Engineer. The reference line may be removed after the completion of the first course of HMA when approved by the Engineer. Whenever the Engineer determines that any of these methods are failing to provide the necessary vertical control, the reference lines will be reinstalled by the Contractor.

Furnish and install all accessories necessary for satisfactory operation of the automatic control equipment.

If the paving machine in use is not providing the required finish, the Engineer may suspend Work as allowed by Section 1-08.6.

5-04.3(3)D Material Transfer Device/Vehicle

Use a material transfer device or vehicle (MTD/V) to deliver the HMA from the hauling equipment to the paving machine for any lift in (or partially in) the top 0.30 feet of the pavement section; however, an MTD/V is not required for HMA placed in irregularly shaped and minor areas such as tapers and turn lanes, or for HMA mixture that is accepted by Visual Evaluation. At the Contractor's request the Engineer may approve paving without an MTD/V; the Engineer will determine if an equitable adjustment in cost or time is due.

The MTD/V shall mix the HMA after delivery by the hauling equipment and prior to placement by the paving machine. The MTD/V shall mix the HMA sufficiently to obtain a uniform temperature throughout the mix. If a windrow elevator is used, the Engineer may limit the length of the windrow in urban areas or through intersections.

5-04.3(3)E Rollers

Operate rollers in accordance with the manufacturer's recommendations. When requested by the Engineer, provide a copy of the manufacturer's recommendation for the use of any roller planned for use on the project. Do not use rollers in a manner that crushes the aggregate, produces pickup, washboard, uneven compaction of the surface, displacement of the mix, or other undesirable results.

5-04.3(4) Preparation of Existing Paved Surfaces

Before constructing HMA on an existing paved surface, clean the entire surface of the pavement. Entirely remove all fatty asphalt patches, grease drippings, and other deleterious matter from the existing pavement to the satisfaction of the Engineer. Thoroughly clean all pavements or bituminous surfaces of dust, soil, pavement grindings, and other foreign matter. Thoroughly remove any cleaning or solvent type liquids used to clean equipment spilled on the pavement before paving proceeds. Fill all holes and small depressions with an appropriate class of HMA. Level and thoroughly compact the surface of the patched area.

Apply a tack coat of asphalt to all paved surfaces on which any course of HMA is to be placed or abutted. Uniformly apply tack coat to cover the cleaned existing pavement with a thin film of residual asphalt free of streaks and bare spots. Apply a heavy application of tack coat to all joints. For Roadways open to traffic, limit the application of tack coat to surfaces that will be paved during the same working shift. Equip the spreading equipment with a thermometer to indicate the temperature of the tack coat material.

Do not operate equipment (nor allow public traffic) on tacked surfaces until the tack has broken and cured. Repair tack coat damaged by the Contractor's operation prior to placement of the HMA.

Unless otherwise approved by the Engineer, use a tack coat of CSS-1, CSS-1h, or Performance Graded (PG) asphalt binder. The CSS-1 and CSS-1h emulsified asphalt may be diluted with water at a rate not to exceed one part water to one part emulsified asphalt. Do not exceed the maximum tack coat temperature recommended by the asphalt manufacturer.

When shown in the Plans, prelevel uneven or broken surfaces over which HMA is to be placed by using an asphalt paver, a motor patrol grader, or by hand raking, as approved by the Engineer.

5-04.3(4)A Crack Sealing

5-04.3(4)A1 General

When the Proposal includes a pay item for crack sealing, seal all cracks and joints ¼ inch in width and greater. Ensure that cracks and joints are thoroughly clean, dry and free of all loose and foreign material when filling with crack sealant material. Use a hot compressed air lance to dry and warm the pavement surfaces within the crack or joint immediately prior to filling a crack or joint with the sealant material. Do not overheat pavement. Do not use direct flame dryers. Routing cracks and joints is not required.

For cracks and joints that are to be filled with sand slurry, thoroughly mix the components and pour the mixture into the cracks and joints until full. Add additional CSS-1 emulsified asphalt to the sand slurry as needed to ensure the mixture will completely fill the crack or joint. Strike off the sand slurry flush with the existing pavement surface and allow the mixture to cure. Top off cracks or joints that were not

completely filled with additional sand slurry. Do not place the HMA overlay until the slurry has fully cured.

For cracks and joints that are to be filled with hot poured sealant, apply the material accordance with these requirements and the manufacturer's recommendations. Furnish the manufacturer's recommendations to the Engineer prior to the start of work, including the manufacturer's recommended heating time and temperatures, allowable storage time and temperatures after initial heating, allowable reheating criteria, and application temperature range.

Confine hot poured sealant material within the crack or joint. Clean any overflow of sealant from the pavement surface. If, in the opinion of the Engineer, the Contractor's method of sealing the cracks and joints with hot poured sealant results in an excessive amount of material on the pavement surface, stop and correct the operation to eliminate the excess material.

5-04.3(4)A2 Crack Sealing Areas Prior to Paving

In areas where HMA will be placed, use sand slurry to fill the cracks and joints.

5-04.3(4)A3 Crack Sealing Areas Not to be Paved

In areas where HMA will not be placed, fill the cracks and joints as follows:

1. Cracks ¼ inch to 1 inch in width - fill with hot poured sealant.
2. Cracks and joints greater than 1 inch in width – fill with sand slurry.

5-04.3(4)B Soil Residual Herbicide

Where shown in the Plans, apply one application of an approved soil residual herbicide. Comply with Section 8-02.3(3)B. Begin paving within 24 hours of applying the herbicide.

Use herbicide registered with the Washington State Department of Agriculture for use under pavement. Before use, obtain the Engineer's approval of the herbicide and the proposed rate of application. Include the following information in the request for approval of the material:

1. Brand Name of the Material,
2. Manufacturer,
3. Environmental Protection Agency (EPA) Registration Number,
4. Material Safety Data Sheet, and
5. Proposed Rate of Application.

5-04.3(4)C Pavement Repair

Excavate pavement repair areas and backfill these with HMA in accordance with the details shown in the Plans and as staked. Conduct the excavation operations in a manner that will protect the pavement that is to remain. Repair pavement not designated to be removed that is damaged as a result of the Contractor's operations to the satisfaction of the Engineer at no cost to the Contracting Agency. Excavate only within one lane at a time unless approved otherwise by the Engineer. Do not excavate more area than can be completely backfilled and compacted during the same shift.

Unless otherwise shown in the Plans or determined by the Engineer, excavate to a depth of 1.0 feet. The Engineer will make the final determination of the excavation depth required.

The minimum width of any pavement repair area shall be 40 inches unless shown otherwise in the Plans. Before any excavation, sawcut the perimeter of the existing pavement to be removed unless the pavement in the pavement repair area is to be

removed by a pavement grinder.

Excavated materials shall be the property of the Contractor and shall be disposed of in a Contractor-provided site off the Right of Way or used in accordance with Sections 2-02.3(3) or 9-03.21.

Apply a heavy application of tack coat to all surfaces of existing pavement in the pavement repair area, in accordance with Section 5-04.3(4).

Place the HMA backfill in lifts not to exceed 0.35-foot compacted depth. Thoroughly compact each lift by a mechanical tamper or a roller.

5-04.3(5) Producing/Stockpiling Aggregates, RAP, & RAS

Produce aggregate in compliance with Section 3-01. Stockpile aggregates, RAP, and RAS according to the requirements of Section 3-02. Provide sufficient storage space for each size of aggregate, RAP and RAS. Fine aggregate or RAP may be uniformly blended with the RAS as a method of preventing the agglomeration of RAS particles. Remove the aggregates, RAP and RAS from stockpile(s) in a manner that ensures minimal segregation when being moved to the HMA plant for processing into the final mix. Keep different aggregate sizes separated until they have been delivered to the HMA plant.

5-04.3(5)A Stockpiling RAP or RAS for High RAP/Any RAS Mixes

Do not place any RAP or RAS into a stockpile which has been sequestered for a High RAP/Any RAS mix design. Do not incorporate any RAP or RAS into a High RAP/Any RAS mix from any source other the stockpile which was sequestered for approval of that particular High RAP/Any RAS mix.

RAP that is used in a Low RAP/No RAS mix is not required to come from a sequestered stockpile.

5-04.3(6) Mixing

The asphalt supplier shall introduce anti-stripping additive, in the amount designated on the QPL for the mix design, into the asphalt binder prior to shipment to the asphalt mixing plant. For High RAP/Any RAS mixes, the asphalt supplier shall increase the amount of anti-strip added in order to account for the amount of binder that will be contributed to the mix from the RAP/RAS during HMA production. The asphalt shipping ticket shall show the anti-strip as a percentage of the virgin binder.

Anti-strip is not required for temporary work that will be removed prior to Physical Completion.

Use binder of the grade and from the supplier in the approved mix design.

Prior to introducing recycled materials into the asphalt plant, remove wire, nails, and any other objectionable material. Discontinue use of the recycled material if the Engineer, in its sole discretion, determines the wire, nails, or other objectionable material to be excessive.

Size RAP prior to entering the mixer to provide uniform and thoroughly mixed HMA. If there is evidence of the RAP not breaking down during the heating and mixing of the HMA, immediately suspend the use of the RAP until changes have been approved by the Engineer.

After the required amount of mineral materials, RAP, RAS, new asphalt binder and asphalt rejuvenator have been introduced into the mixer, mix the HMA until complete and uniform coating of the particles and thorough distribution of the asphalt binder throughout the mineral materials, RAP and RAS is ensured.

Upon discharge from the mixer, ensure that the temperature of the HMA does not

exceed the optimum mixing temperature shown on the approved Mix Design Report by more than 25°F, or as approved by the Engineer. When a WMA additive is included in the manufacture of HMA, do not allow the discharge temperature of the HMA to exceed the maximum recommended by the manufacturer of the WMA additive.

A maximum water content of 2 percent in the mix, at discharge, will be allowed providing the water causes no problems with handling, stripping, or flushing. If the water in the HMA causes any of these problems, reduce the moisture content.

During the daily operation, HMA may be temporarily held in approved storage facilities. Do not incorporate HMA into the Work that has been held for more than 24 hours after mixing. Provide an easily readable, low bin-level indicator on the storage facility that indicates the amount of material in storage. Waste the HMA in storage when the top level of HMA is below the top of the cone of the storage facility, except as the storage facility is being emptied at the end of the working shift. Dispose of rejected or waste HMA at no expense to the Contracting Agency.

5-04.3(7) Spreading and Finishing

Do not exceed the maximum nominal compacted depth of any layer of any course, as shown in Table 7, unless approved by the Engineer:

Table 7
Maximum Nominal Compacted Depth of Any Layer

HMA Class	Wearing Course	Other than Wearing Course
1 inch	0.35 feet	0.35 feet
¾ and ½ inch	0.30 feet	0.35 feet
3/8 inch	0.15 feet	0.15 feet

Use HMA pavers complying with Section 5-04.3(3) to distribute the mix. On areas where irregularities or unavoidable obstacles make the use of mechanical spreading and finishing equipment impractical, the paving may be done with other equipment or by hand.

When more than one JMF is being utilized to produce HMA, place the material produced for each JMF with separate spreading and compacting equipment. Do not intermingle HMA produced from more than one JMF. Each strip of HMA placed during a work shift shall conform to a single JMF established for the class of HMA specified unless there is a need to make an adjustment in the JMF.

5-04.3(8) Aggregate Acceptance Prior to Incorporation in HMA

Use aggregate which, prior to being incorporated into the HMA, meets the requirements of Section 3-04. Responsibility for taking acceptance samples shall be as described in Section 3-04. Acceptance testing will be performed by the Contracting Agency. Aggregate contributed from RAP and/or RAS will not be evaluated under Section 3-04 prior to being incorporated into the HMA mixture.

For aggregate that will be used in HMA mixture which will be accepted by either Statistical or Nonstatistical Evaluation, the Contracting Agency’s acceptance of the aggregate will be based on:

1. Samples taken prior to mixing with asphalt binder, RAP, or RAS;
2. Testing for the materials properties of fracture, uncompacted void content, and sand equivalent;

3. Evaluation by the Contracting Agency in accordance with Section 3-04.

For aggregate that will be used in HMA mixture which will be accepted by Visual Evaluation, the Contracting Agency's evaluation in accordance with items 1, 2, and 3 above is at the discretion of the Contracting Agency.

5-04.3(9) HMA Mixture Acceptance

The Contracting Agency will evaluate HMA mixture for acceptance by one of three methods as determined from the criteria in Table 8.

**Table 8
Basis of Acceptance for HMA Mixture**

	Visual Evaluation	Nonstatistical Evaluation	Statistical Evaluation
Criteria for Selecting the Evaluation Method	<ul style="list-style-type: none"> • Commercial HMA placed at any location • Any HMA placed in: <ul style="list-style-type: none"> ○ sidewalks ○ road approaches ○ ditches ○ slopes ○ paths ○ trails ○ gores ○ prelevel ○ temporary pavement ^(note 1) ○ pavement repair • Other nonstructural applications of HMA as approved by the Engineer 	<ul style="list-style-type: none"> • All HMA mixture of the same class and PG binder grade with a Proposal quantity less than 4,000 tons. (Exclude HMA mixture accepted by Visual Evaluation.) 	<ul style="list-style-type: none"> • All HMA mixture other than that accepted by Visual- or Nonstatistical Evaluation

Note 1: Temporary pavement is HMA that will be removed before physical completion of the Contract.

5-04.3(9)A Mixture Acceptance – Statistical Evaluation

5-04.3(9)A1 Mixture Statistical Evaluation – Lots and Sublots

HMA mixture which is accepted by Statistical Evaluation will be evaluated by dividing that HMA tonnage into mixture lots, and each mixture lot will be evaluated using stratified random sampling by breaking each mixture lot into mixture sublots. All mixture in a mixture lot shall be of the same class and binder grade.

A mixture lot is defined as 15 consecutive mixture sublots of the same class and binder grade, except for the final mixture lot on the contract. The final mixture lot on a contract shall be a minimum of 15 consecutive sublots of the same class and binder grade, with a maximum of 25 sublots. The following shall cause one mixture lot to end prematurely and a new mixture lot to begin:

- Any change described in Section 5-04.2(1)C requiring a new mix design, unless otherwise approved by the Engineer.
- Each day of test section paving.

- If, before completing a mixture lot, the Contractor requests a change to the JMF that is approved by the Engineer, the mixture produced in that lot after the approved change will be evaluated on the basis of the changed JMF, and the mixture produced in that lot before the approved change will be evaluated on the basis of the unchanged JMF; however, the mixture before and after the change will be evaluated as one lot. Acceptance of subsequent mixture lots will be evaluated on the basis of the changed JMF.
- For a mixture lot in progress with a mixture CPF less than 0.75, a new mixture lot will begin at the Contractor's request after the Engineer is satisfied that material conforming to the Specifications can be produced.

Each mixture subplot shall be approximately uniform in size with the maximum mixture subplot size as specified in Table 9. The quantity of material represented by the final mixture subplot may be increased to a maximum of two times the mixture subplot quantity calculated. No mixture lot may contain fewer than three mixture sublots.

Table 9
Maximum HMA Mixture Sublot Size
For HMA Accepted by Statistical Evaluation

HMA Original Plan Quantity (tons) <small>(note 1)</small>	Maximum Sublot Size (tons) <small>(note 2)</small>
< 20,000	1,000
20,000 to 30,000	1,500
>30,000	2,000

Note 1: "Plan quantity" means the plan quantity of all HMA of the same class and binder grade which is accepted by Statistical Evaluation.
 Note 2: The maximum subplot size for each combination of HMA class and binder grade shall be calculated separately.

5-04.3(9)A2 Mixture Statistical Evaluation – Sampling

HMA mixture samples will be randomly selected from within each subplot, with one sample per subplot. The Engineer will determine the random sample location of all HMA mixture samples, using WSDOT Test Method T 716. The Contractor shall obtain the sample when ordered by the Engineer. The Contractor shall sample the HMA mixture in the presence of the Engineer and in accordance with WSDOT FOP for WAQTC T 168.

5-04.3(9)A3 Mixture Statistical Evaluation – Test Section

This Section 5-04.3(9)A3 applies to HMA mixture accepted by Statistical Evaluation or Nonstatistical Evaluation.

The purpose of a test section is to determine, at the beginning of paving, whether or not the Contractor's mix design and production processes will produce HMA meeting the Contract requirements. Conducting the test section is either mandatory or at the contractor's option, as shown in Table 10. Each mix design will be evaluated independently for the test section requirements.

Table 10
Criteria for Conducting and Evaluating HMA Mixture Test Sections (note 1)

	RAP > 20% or Any RAS <small>(note 2)</small>	RAP ≤ 20% and NO RAS <small>(note 2)</small>

Is the HMA mixture Test Section Optional or Mandatory?		Mandatory ^(note 3)	At Contractor's Option ^(note 4)
Results Required to Stop Performing Test Sections	Minimum Pay Factor for gradation	0.95 based on the criteria in Section 5-04.3(9)A5 (note 5)	N/A
	Minimum Pay Factor for asphalt binder	0.95 based on the criteria in Section 5-04.3(9)A5 (note 5)	N/A
	Minimum Pay Factor for Va	0.95 based on the criteria in Section 5-04.3(9)A5 (note 5)	N/A
	Dust/asphalt ratio Sand Equivalent Fine Aggregate Angularity Fracture Hamburg Wheel Track Test Indirect Tensile Strength	Meet requirements of Section 9-03.8(2). One sample is required per test section	N/A
Waiting period between paving a test section and resuming paving. ^(note 7)		4 calendar days ^(note 6)	None
What Must Happen to Stop Performing Test Sections?		Continue performing test sections until meeting the criteria in this Table. ^(note 7)	Only one Test Section is allowed.

Note 1: This Table and the criteria therein shall be used exclusively for determining whether conducting Test Sections must continue or not for a given mix design. Acceptance of the HMA mixture used in all test sections is subject to the acceptance criteria and price adjustments for Statistical Evaluation or Non-statistical Evaluation (see Table 8).

Note 2. All percentages in this table and notes are by total weight of mixture.

Note 3: For mixes with RAP >20% or any amount of RAS, constructing the test section is mandatory based solely on the mix containing RAP > 20% or any amount of RAS. This means that, for such cases, constructing the test section is mandatory regardless of whether acceptance of the mixture is Statistical Evaluation or Nonstatistical Evaluation – in either case the statistical criteria in this column shall apply.

Note 4: For mixes with RAP ≤ 20% and No RAS — which are accepted by Statistical Evaluation — performing the test section is at the Contractor's option. For mixes with RAP ≤ 20% and no RAS — which are accepted by Nonstatistical or Visual Evaluation — a test section is neither required nor allowed.

Note 5: A minimum of 3 samples is required per Test Section.

Note 6. Do not pave using the mix design being evaluated in the test section for four calendar days following construction of the test section. This is to provide

time needed by the Contracting Agency to evaluate the mix paved in the test section. Paving may resume sooner than four calendar days provided the Contracting Agency has completed the testing required to determine if “Acceptable Results” have been achieved.

Note 7: If the criteria in this Table are met, production paving may begin. If the criteria in this table are not met one a Test Section, another Test Section is required, unless otherwise approved by the Headquarters Materials Lab.

Construct HMA mixture test sections at the beginning of paving, using at least 600 tons and a maximum of 1,000 tons or as approved by the Engineer. The mixture in each test section will be evaluated as a separate mixture lot, and each mixture lot shall have a minimum of three mixture sublots. The mixture in the test section will be evaluated, based on the criteria in Table 10, as a mixture lot with a minimum of three mixture sublots required.

If more than one test section is required, each test section shall be evaluated as a separate mixture lot.

5-04.3(9)A4 Mixture Statistical Evaluation – Acceptance Testing

The Contracting Agency will test the mixture sample from each production sublot (i.e., sublots not part of a test section) for the properties shown in Table 11.

Table 11

Testing Required for each HMA Mixture Sublot

Test	Procedure	Performed by
Va	WSDOT SOP 731	Engineer
Asphalt Binder Content	FOP for AASHTO T 308	Engineer
Gradation: Percent Passing 1½", 1", ¾", ½", ⅜", No. 4, No. 8, No. 200,	FOP for WAQTC T 27/T 11	Engineer

5-04.3(9)A5 Mixture Statistical Evaluation – Pay Factors

The Contracting Agency will determine a pay factor (PF_i) for each of the properties in Table 11, for each mixture lot, using the quality level analysis in Section 1-06.2(2)D. For Gradation, a pay factor will be calculated for each of the sieve sizes listed in Table 11 which is equal to or smaller than the maximum allowable aggregate size (100 percent passing sieve) of the HMA mixture. The USL and LSL shall be calculated using the Job Mix Formula Tolerances (for Statistical Evaluation) in accordance with item 1 under Section 9-03.8(7).

If a constituent is not measured in accordance with these Specifications, its individual pay factor will be considered 1.00 in calculating the Composite Pay Factor (CPF).

5-04.3(9)A6 Mixture Statistical Evaluation – Composite Pay Factors (CPF)

In accordance with Section 1-06.2(2)D4, the Contracting Agency will determine a Composite Pay Factor (CPF) for each mixture lot from the pay factors calculated in Section 5-04.3(9)A5, using the price adjustment factors in Table 12. Unless otherwise specified, the maximum CPF for HMA mixture shall be 1.05.

Table 12

HMA Mixture Price Adjustment Factors

Constituent	Factor "F"
All aggregate passing: 1½", 1", ¾", ½", ⅜" and No.4 sieves	2
All aggregate passing No. 8 sieve	15
All aggregate passing No. 200 sieve	20
Asphalt binder	40
Air Voids (Va)	20

5-04.3(9)A7 Mixture Statistical Evaluation - Price Adjustments

For each HMA mixture lot, a Job Mix Compliance Price Adjustment will be determined and applied, as follows:

$$JMCPA = [0.60 \times (CPF - 1.00)] \times Q \times UP$$

Where

JMCPA = Job Mix Compliance Price Adjustment for a given lot of mixture (\$)

CPF = Composite Pay factor for a given lot of mixture (maximum is 1.05)

Q = Quantity in a given lot of mixture (tons)

UP = Unit price of the HMA in a given lot of mixture (\$/ton)

5-04.3(9)A8 Mixture Statistical Evaluation – Retests

The Contractor may request that a mixture subplot be retested. To request a retest, submit a written request to the Contracting Agency within 7 calendar days after the specific test results have been posted to the website. The Contracting Agency will send a split of the original acceptance sample for testing by the Contracting Agency to either the Region Materials Laboratory or the State Materials Laboratory as determined by the Engineer. The Contracting Agency will not test the split of the sample with the same equipment or by the same tester that ran the original acceptance test. The sample will be tested for a complete gradation analysis, asphalt binder content, and Va, and the results of the retest will be used for the acceptance of the HMA mixture in place of the original mixture subplot sample test results. The cost of testing will be deducted from any monies due or that may come due the Contractor under the Contract at the rate of \$250 per sample.

5-04.3(9)B Mixture Acceptance - Nonstatistical Evaluation

5-04.3(9)B1 Mixture Nonstatistical Evaluation – Lots, Sublots, Sampling, Test Section, Testing, Retests

For HMA mixture accepted by Nonstatistical Evaluation, comply with the requirements in Table 13:

**Table 13
Nonstatistical Evaluation
Lots, Sublots, Sampling, Test Section, Testing, Retests**

Comply with the Specifications Below		Comply with the Requirements of the Section for:
Lots and Sublots	Section 5-04.3(9)A1	Statistical Evaluation

Sampling	Section 5-04.3(9)A2	Statistical Evaluation
Test Section	Section 5-04.3(9)A3	Nonstatistical Evaluation
Acceptance Testing	Section 5-04.3(9)A4	Statistical Evaluation
Retests	Section 5-04.3(9)A8	Statistical Evaluation

5-04.3(9)B2 Mixture Nonstatistical Evaluation - Acceptance

Each mixture lot of HMA produced under Nonstatistical Evaluation, and having all constituents falling within the Job Mix Formula Tolerances (for Nonstatistical Evaluation) in Section 9-03.8(7), shall be accepted at the unit Contract price with no further evaluation.

5-04.3(9)B3 Mixture Nonstatistical Evaluation – Out of Tolerance Procedures

When one or more constituents fall outside of the Job Mix Formula Tolerances (for Nonstatistical Evaluation) in Section 9-03.8(7), the mixture lot shall be evaluated in accordance with Table 14 to determine a Job Mix Compliance Price Adjustment:

Table 14

Nonstatistical Evaluation – Out of Tolerance Procedures

Comply with the Following ^(note 1)	
Pay Factors ^(note 2)	Section 5-04.3(9)A5
Composite Pay Factors ^(note 3)	Section 5-04.3(9)A6
Price Adjustments	Section 5-04.3(9)A7

Note 1: When less than three mixture sublots exist, backup samples of the existing mixture sublots shall be tested to provide a minimum of three sets of results for evaluation. If enough backup samples are not available, the Contracting Agency will select core sample locations from the Roadway in accordance with WSDOT Test Method T 716, take cores from the roadway in accordance with WSDOT SOP 734, and test the cores in accordance with WSDOT SOP 737.

Note 2: The Nonstatistical Evaluation tolerance limits in Section 9-03.8(7) will be used in the calculation of the PF_i.

Note 3: The maximum CPF shall be 1.00.

5-04.3(9)C Mixture Acceptance – Visual Evaluation

Visual Evaluation of HMA mixture will be by Visual inspection by the Engineer or, in the sole discretion of the Engineer, the Engineer may sample and test the mixture.

5-04.3(9)C1 Visual Evaluation – Lots, Sampling, Testing, Price Adjustments

HMA mixture accepted by Visual Evaluation will not be broken into lots unless the Engineer determines that testing is required. When that occurs, the Engineer will identify the limits of the questionable HMA mixture, and that questionable HMA mixture shall constitute a lot. Then, the Engineer will take core samples at a minimum of three random locations from within the lot, selected in accordance with WSDOT Test Method T 716, taken from the roadway in accordance with WSDOT SOP 734, and tested in accordance with WSDOT SOP 737. The Engineer will test one of the samples for all constituents in Section 5-04.3(9)A4. If all constituents from that test fall within the Job Mix Formula Tolerances (for Visual Evaluation) in Section 9-03.8(7), the lot will be accepted at the unit Contract price with no further evaluation.

When one or more constituents fall outside those tolerance limits, the other samples will be tested for all constituents in 5-04.3(9)A4, and a Job Mix Compliance Price

Adjustment will be calculated in accordance with Table 15.

**Table 15
Visual Evaluation – Out of Tolerance Procedures**

Comply with the Following	
Pay Factors ^(note 1)	Section 5-04.3(9)A5
Composite Pay Factors ^(note 2)	Section 5-04.3(9)A6
Price Adjustments	Section 5-04.3(9)A7

Note 1: The Visual Evaluation tolerance limits in Section 9-03.8(7) will be used in the calculation of the PF_i.

Note 2: The maximum CPF shall be 1.00.

5-04.3(9)D Mixture Acceptance – Notification of Acceptance Status

The Contracting Agency will endeavor to provide written notification (via email to the Contractor’s designee) of acceptance test results in MATS and the changes those test results effect in SAM, within 24 hours of the sample coming into custody of the Contracting Agency. However, the Contractor agrees:

1. Quality control, defined as the system used by the Contractor to monitor, assess, and adjust its production processes to ensure that the final HMA mixture will meet the specified level of quality, is the sole responsibility of the Contractor.
2. The Contractor has no right to rely on any testing performed by the Contracting Agency, nor does the Contractor have any right to rely on timely notification by the Contracting Agency of the Contracting Agency’s test results (or statistical analysis thereof), for any part of quality control and/or for making changes or correction to any aspect of the HMA mixture.
3. The Contractor shall make no claim for untimely notification by the Contracting Agency of the Contracting Agency’s test results or statistical analysis.

5-04.3(10) HMA Compaction Acceptance

For all HMA, the Contractor shall comply with the General Compaction Requirements in Section 5-04.3(10)A. The Contracting Agency will also evaluate all HMA for compaction compliance with one of the following - Statistical Evaluation, Visual Evaluation, or Test Point Evaluation - determined by the criteria in Table 16:

**Table 16
Criteria for Determining Method of Evaluation for HMA Compaction**

Statistical Evaluation of HMA compaction is required for:	Visual Evaluation of HMA Compaction is required for:	Test Point Evaluation of HMA compaction is required for:
<ul style="list-style-type: none"> • Any HMA for which the specified course thickness is greater than 0.10 feet, and the HMA is in <ul style="list-style-type: none"> • traffic lanes, or • ramp lanes, or • truck climbing 	<ul style="list-style-type: none"> • Preleveling ^(note 1) 	<ul style="list-style-type: none"> • any HMA not meeting the criteria for Statistical Evaluation or Visual Evaluation

lanes, or • weaving lanes, or • speed change lanes.		
---	--	--

Note 1: HMA for preleveling shall be thoroughly compacted. HMA that is used to prelevel wheel ruts shall be compacted with a pneumatic tire roller.

The Contracting Agency may, at its sole discretion, evaluate any HMA for compliance with the Cyclic Density requirements of Section 5-04.3(10)B.

5-04.3(10)A HMA Compaction – General Compaction Requirements

Immediately after the HMA has been spread and struck off, and after surface irregularities have been adjusted, thoroughly and uniformly compact the mix. The completed course shall be free from ridges, ruts, humps, depressions, objectionable marks, and irregularities and shall conform to the line, grade, and cross-section shown in the Plans. If necessary, alter the JMF in accordance with Section 9-03.8(7) to achieve desired results.

Compact the mix when it is in the proper condition so that no undue displacement, cracking, or shoving occurs. Compact areas inaccessible to large compaction equipment by mechanical or hand tampers. Remove HMA that becomes loose, broken, contaminated, shows an excess or deficiency of asphalt, or is in any way defective. Replace the removed material with new hot mix, and compact it immediately to conform to the surrounding area.

The type of rollers to be used and their relative position in the compaction sequence shall generally be the Contractor’s option, provided the specified densities are attained. An exception shall be that pneumatic tired rollers shall be used for compaction of the wearing course beginning October 1st of any year through March 31st of the following year. Coverage with a steel wheel roller may precede pneumatic tired rolling. Unless the Engineer has approved otherwise, operate rollers in the static mode when the internal temperature of the mix is less than 175°F. Regardless of mix temperature, do not operate a roller in a mode that results in checking or cracking of the mat. On bridge decks, operate rollers in static mode only.

5-04.3(10)B HMA Compaction - Cyclic Density

Low cyclic density areas are defined as spots or streaks in the pavement that are less than 90 percent of the theoretical maximum density. At the Engineer’s discretion, the Engineer may evaluate the HMA pavement for low cyclic density, and when doing so will follow WSDOT SOP 733. A \$500 Cyclic Density Price Adjustment will be assessed for any 500-foot section with two or more density readings below 90 percent of the theoretical maximum density.

5-04.3(10)C Compaction Acceptance- Statistical Evaluation

HMA compaction which is accepted by Statistical Evaluation will be based on acceptance testing performed by the Contracting Agency, and statistical analysis of those acceptance tests results. This will result in a Compaction Incentive Price Adjustment.

5-04.3(10)C1 Compaction Statistical Evaluation – Lots and Sublots

HMA compaction which is accepted by Statistical Evaluation will be evaluated by the Contracting Agency breaking the project into compaction lots, and each compaction lot will be evaluated using stratified random sampling by breaking each compaction lot into

compaction sublots.

A compaction lot is defined as 15 consecutive compaction sublots, except for the final compaction lot on the contract. The final compaction lot on a contract shall be a minimum of 15 consecutive sublots, with a maximum of 25 sublots. The following shall cause one compaction lot to end prematurely and a new compaction lot to begin:

- Any change described in Section 5-04.2(1)C requiring a new mix design, unless otherwise approved by the Engineer.
- For a compaction lot in progress with a compaction CPF less than 0.75, a new compaction lot will begin at the Contractor’s request after the Engineer is satisfied that material conforming to the Specifications can be produced.

Each compaction subplot shall be uniform in size; use Table 17 to determine the subplot size.

**Table 17
HMA Compaction Sublot Size**

HMA Original Plan Quantity (tons) ^(note 1)	Compaction Sublot Size (tons)
<20,000	100
20,000 to 30,000	150
>30,000	200

Note 1: In determining the plan quantity tonnage, do not include any tons accepted by test point evaluation.

5-04.3(10)C2 Compaction Statistical Evaluation – Acceptance Testing

The location of HMA compaction acceptance tests will be randomly selected by the contracting Agency from within each subplot, with one test per subplot. The Contracting Agency will determine the random sample location using WSDOT Test Method T 716.

Use Table 18 to determine compaction acceptance test procedures and to allocate compaction acceptance sampling and testing responsibilities between the Contractor and the Contracting Agency. Cores shall be taken or nuclear density testing shall occur after completion of the finish rolling, prior to opening to traffic, and on the same day that the mix is placed.

**Table 18
HMA Compaction Testing Procedures and Responsibilities**

	When Contract Includes Bid Item “Roadway Cores”	When Contract Does Not Include Bid Item “Roadway Cores”	
Basis for Test:	Cores	Cores ^(note 3)	Nuclear Gauge ^(note 3)

In-Place Density determined by:	Contractor shall take cores ^(note 1) using WSDOT SOP 734 ^(note 2)	Contracting Agency will take cores ^(note 1) using WSDOT SOP 734	Contracting Agency, using FOP for WAQTC TM 8
Theoretical Maximum Density Determined by:	Contracting Agency, using WSDOT FOP for AASHTO T 209		
Rolling Average of Reference Density Determined by:	N/A	N/A	Contracting Agency, using WSDOT SOP 729
Percent Compaction in Each Sublot Determined by:	Contracting Agency, using WSDOT SOP 736	Contracting Agency, using WSDOT SOP 736	Contracting Agency, using WSDOT FOP for WAQTC TM 8

Note 1: The core diameter shall be 4-inches unless otherwise approved by the Engineer

Note 2: The Contractor shall take the core samples in the presence of the Engineer, at locations designated by the Engineer, and deliver the core samples to the Contracting Agency.

Note 3: The contracting agency will determine, in its sole discretion, whether it will take cores or use the nuclear density gauge to determine in-place density.

When using the nuclear gauge for acceptance testing of pavement density, the Engineer follow WSDOT SOP 730 for correlating the nuclear gauge with HMA cores. When cores are required for the correlation, coring and testing will be by the Contracting Agency. When a core is taken for gauge correlation at the location of a sublot, the relative density of the core will be used for the sublot test result and is exempt from retesting.

5-04.3(10)C3 HMA Statistical Compaction - Price Adjustments

For each HMA compaction lot with less than three compaction sublots, for which all compaction sublots attain a relative density that is 91 percent of the theoretical maximum density, the HMA shall be accepted at the unit Contract price with no further evaluation.

For a compaction lot with any compaction sublot that does not attain a relative density that is 91 percent or more of the theoretical maximum density, the compaction lot shall be evaluated in accordance with Section 1-06.2 and the following to determine the appropriate Compaction Price Adjustment (CPA). All of the test results obtained from the acceptance samples from a given compaction lot shall be evaluated collectively. Additional testing by either a nuclear density gauge or cores will be completed as required to provide a minimum of three tests for evaluation.

For the statistical analysis in Section 1-06.2, use the following values:

x = individual test density

Where “individual test density” is as a percentage of the theoretical maximum density x 100

USL = 100

LSL = 91

Each Compaction Price Adjustment will be determined as follows:

$$\text{CPA} = [0.40 \times (\text{CPF} - 1.00)] \times Q \times \text{UP}$$

Where

CPA = Compaction Price Adjustment for the compaction lot (\$)

CPF = Compaction Pay Factor for the compaction lot (maximum is 1.05)

Q = Quantity in a the compaction lot (tons)

UP = Unit price of the HMA in the compaction lot (\$/ton)

5-04.3(10)C4 HMA Statistical Compaction – Requests for Retesting

For a compaction subplot that has been tested with a nuclear density gauge that did not meet the minimum of 91 percent of the theoretical maximum density in a compaction lot with a CPF below 1.00 and thus subject to a price reduction or rejection, the Contractor may request that a core be used for determination of the relative density of the compaction subplot. The relative density of the core will replace the relative density determined by the nuclear density gauge for the compaction subplot and will be used for calculation of the CPF and acceptance of HMA compaction lot. When cores are taken by the Contracting Agency at the request of the Contractor, they shall be requested by noon of the next workday, prior to opening to traffic, after the test results for the compaction subplot have been provided or made available to the Contractor. Traffic control shall be provided by the Contractor as requested by the Engineer. Failure by the Contractor to provide the requested traffic control will result in forfeiture of the request for cores. When the CPF for the compaction lot based on the results of the HMA cores is less than 1.00, the Contracting Agency will deduct the cost for the coring from any monies due or that may become due the Contractor under the Contract at the rate of \$200 per core and the Contractor shall pay for the cost of the traffic control.

5-04.3(10)D HMA Compaction – Visual Evaluation

Visual Evaluation will be used on prelevel. HMA for preleveling shall be thoroughly compacted. HMA that is used to prelevel wheel ruts shall be compacted with a pneumatic tire roller.

5-04.3(10)E HMA Compaction – Test Point Evaluation

When compaction acceptance is by Test Point Evaluation, compact HMA based on a test point evaluation of the compaction train. Perform the test point evaluation in accordance with instructions from the Engineer. The number of passes with an approved compaction train, required to attain the maximum test point density, shall be used on all subsequent paving.

5-04.3(11) Reject Work

This Section applies to HMA and all requirements related to HMA except aggregate prior to being incorporated into HMA. For rejection of aggregate prior to its incorporation into HMA refer to Section 3-04.

5-04.3(11)A Reject Work - General

Work that is defective or does not conform to Contract requirements shall be rejected.

5-04.3(11)B Rejection by Contractor

The Contractor may, prior to acceptance sampling and testing, elect to remove any defective material and replace it with new material. Any such new material will be sampled, tested, and evaluated for acceptance.

5-04.3(11)C Rejection Without Testing

The Engineer may, without sampling, reject any batch, load, or section of Roadway that appears defective. Material rejected before placement shall not be incorporated into the pavement. Any rejected HMA shall be removed.

No payment will be made for the rejected materials or the removal of the materials unless the Contractor requests the rejected material to be tested. If the Contractor requests testing, acceptance will be by Statistical Evaluation. When uncompacted material is required for testing but not available, the Engineer will determine random sample locations on the roadway in accordance with WSDOT Test Method T 716, take cores in accordance with WSDOT SOP 734, and test the cores in accordance with WSDOT SOP 737.

If the CPF for the rejected material is less than 0.75, no payment will be made for the rejected material; in addition, the cost of sampling and testing shall be borne by the Contractor. If the CPF is greater than or equal to 0.75, the cost of sampling and testing will be borne by the Contracting Agency. If the material is rejected before placement and the CPF is greater than or equal to 0.75, compensation for the rejected material will be at a CPF of 0.75. If rejection occurs after placement and the CPF is greater than or equal to 0.75, compensation for the rejected material will be at the calculated CPF with an addition of 25 percent of the unit Contract price added for the cost of removal and disposal.

5-04.3(11)D Rejection – Contractor Proposal for Resolution

When HMA has been rejected (whether for mixture or compaction, and regardless of the acceptance evaluation method) the Contractor shall submit to the Engineer a written description of how the Contractor proposes to resolve the rejection issue. Final resolution is subject to the Engineer's approval. All such rejected material is subject to the requirements of Section 1-06.2(2).

5-04.3(11)E Rejection - A Partial Sublot (Mixture or Compaction)

In addition to the random acceptance sampling and testing, the Engineer may also isolate from a mixture or compaction sublot any material that is suspected of being defective in relative density, gradation or asphalt binder content. Such isolated material will not include an original sample location. The Contracting Agency will obtain a minimum of three random samples of the suspect material and perform the testing. When uncompacted material is required for testing but is not available, the Engineer will select random sample locations on the roadway in accordance with WSDOT Test Method T 716, take cores samples in accordance with WSDOT SOP 734, and test the material in accordance with WSDOT Sop 737. The material will then be statistically evaluated as an independent lot in accordance with Section 1-06.2(2).

5-04.3(11)F Rejection - An Entire Sublot (Mixture or Compaction)

An entire mixture or compaction sublot that is suspected of being defective may be rejected. When this occurs, a minimum of two additional random samples from this sublot will be obtained. When uncompacted material is required for the additional samples but the material has been compacted, the Contracting Agency will take and test

cores from the roadway as described in Section 5-04.3(11)E. The additional samples and the original subplot will be evaluated as an independent lot in accordance with Section 1-06.2(2).

5-04.3(11)G Rejection - A Lot in Progress (Mixture or Compaction)

The Contractor shall shut down operations and shall not resume HMA placement until such time as the Engineer is satisfied that material conforming to the Specifications can be produced when:

1. the Composite Pay Factor (CPF) of a mixture or compaction lot in progress drops below 1.00 and the Contractor is taking no corrective action, or
2. the Pay Factor (PF_i) for any constituent of a mixture or compaction lot in progress drops below 0.95 and the Contractor is taking no corrective action, or
3. either the PF_i for any constituent or the CPF of a mixture or compaction lot in progress is less than 0.75.

5-04.3(11)H Rejection - An Entire Lot

An entire lot with a CPF of less than 0.75 will be rejected.

5-04.3(12) Joints

5-04.3(12)A Transverse Joints

Conduct operations such that the placing of the top or wearing course is a continuous operation or as close to continuous as possible. Unscheduled transverse joints will be allowed and the roller may pass over the unprotected end of the freshly laid mix only when the placement of the course must be discontinued for such a length of time that the mix will cool below compaction temperature. When the Work is resumed, cut back the previously compacted mix to produce a slightly beveled edge for the full thickness of the course.

Construct a temporary wedge of HMA on a 50H:1V where a transverse joint as a result of paving or planing is open to traffic. Separate the HMA in the temporary wedge from the permanent HMA upon which it is placed by strips of heavy wrapping paper or other methods approved by the Engineer. Remove the wrapping paper and trim the joint to a slightly beveled edge for the full thickness of the course prior to resumption of paving.

Waste the material that is cut away and place new mix against the cut. Use rollers or tamping irons to seal the joint.

5-04.3(12)B Longitudinal Joints

Offset the longitudinal joint in any one course from the course immediately below by not more than 6 inches nor less than 2 inches. Locate all longitudinal joints constructed in the wearing course at a lane line or an edge line of the Traveled Way. Construct a notched wedge joint along all longitudinal joints in the wearing surface of new HMA unless otherwise approved by the Engineer. The notched wedge joint shall have a vertical edge of not less than the maximum aggregate size or more than 1/2 of the compacted lift thickness and then taper down on a slope not steeper than 4H:1V. Uniformly compact the sloped portion of the HMA notched wedge joint.

On one-lane ramps a longitudinal joint may be constructed at the center of the traffic lane, subject to approval by the Engineer, if:

1. The ramp must remain open to traffic, or
2. The ramp is closed to traffic and a hot-lap joint is constructed.

- a. If a hot-lap joint is allowed at the center of the traffic lane, two paving machines shall be used; a minimum compacted density in accordance with Section 5-04.3(10)C shall be achieved throughout the traffic lane; and construction equipment other than rollers shall not operate on any uncompacted mix.

When HMA is placed adjacent to cement concrete pavement, construct longitudinal joints between the HMA and the cement concrete pavement. Saw the joint to the dimensions shown on Standard Plan A-40.10 and fill with joint sealant meeting the requirements of Section 9-04.2.

5-04.3(13) Surface Smoothness

The completed surface of all courses shall be of uniform texture, smooth, uniform as to crown and grade, and free from defects of all kinds. The completed surface of the wearing course shall not vary more than $\frac{1}{8}$ inch from the lower edge of a 10-foot straightedge placed on the surface parallel to the centerline. The transverse slope of the completed surface of the wearing course shall vary not more than $\frac{1}{4}$ inch in 10 feet from the rate of transverse slope shown in the Plans.

When deviations in excess of the above tolerances are found that result from a high place in the HMA, correct the pavement surface by one of the following methods:

1. Removal of material from high places by grinding with an approved grinding machine, or
2. Removal and replacement of the wearing course of HMA, or
3. By other method approved by the Engineer.

Correct defects until there are no deviations anywhere greater than the allowable tolerances.

Deviations in excess of the above tolerances that result from a low place in the HMA and deviations resulting from a high place where corrective action, in the opinion of the Engineer, will not produce satisfactory results will be accepted with a price adjustment. The Engineer shall deduct from monies due or that may become due to the Contractor the sum of \$500.00 for each and every section of single traffic lane 100 feet in length in which any excessive deviations described above are found.

When portland cement concrete pavement is to be placed on HMA, the surface tolerance of the HMA shall be such that no surface elevation lies above the Plan grade minus the specified Plan depth of portland cement concrete pavement. Prior to placing the portland cement concrete pavement, bring any such irregularities to the required tolerance by grinding or other means approved by the Engineer.

When utility appurtenances such as manhole covers and valve boxes are located in the Traveled Way, pave the Roadway before the utility appurtenances are adjusted to the finished grade.

5-04.3(14) Planing Bituminous Pavement

Plane in such a manner that the underlying pavement is not torn, broken, or otherwise damaged by the planing operation. Delamination or raveling of the underlying pavement will not be construed as damage due to the Contractor's operations. Pavement outside the limits shown in the Plans or designated by the Engineer that is damaged by the Contractor's operations shall be repaired to the satisfaction of the Engineer, at the Contractor's expense.

For mainline planing operations, use equipment with automatic controls and with sensors for either or both sides of the equipment. The controls shall be capable of sensing

the grade from an outside reference line, or a mat-referencing device. The automatic controls shall have a transverse slope controller capable of maintaining the mandrel at the desired transverse slope (expressed as a percentage) within plus or minus 0.1 percent.

Sweep all loose debris from the planed surface before opening the planed surface to traffic. The planings and other debris resulting from the planing operation shall become the property of the Contractor and be disposed of in accordance with Section 2-03.3(7)C, or as otherwise allowed by the contract.

5-04.3(15) Sealing Pavement Surfaces

Apply a fog seal where shown in the Plans. Construct the fog seal in accordance with Section 5-02.3. Unless otherwise approved by the Engineer, apply the fog seal prior to opening to traffic.

5-04.3(16) HMA Road Approaches

Construct HMA approaches at the locations shown in the Plans or where staked by the Engineer, in accordance with Section 5-04.

5-04.4 Measurement

HMA Cl. ___ PG ___, HMA for ___ Cl. ___ PG ___, and Commercial HMA will be measured by the ton in accordance with Section 1-09.2, with no deduction being made for the weight of asphalt binder, mineral filler, or any other component of the mix. If the Contractor elects to remove and replace mix as allowed by Section 5-04.3(11), the material removed will not be measured.

Roadway cores will be measured per each for the number of cores taken.

Soil residual herbicide will be measured by the mile for the stated width to the nearest 0.01 mile or by the square yard, whichever is designated in the Proposal.

Pavement repair excavation will be measured by the square yard of surface marked prior to excavation.

Asphalt for fog seal will be measured by the ton, as provided in Section 5-02.4.

Longitudinal joint seals between the HMA and cement concrete pavement will be measured by the linear foot along the line and slope of the completed joint seal.

Planing bituminous pavement will be measured by the square yard.

Temporary pavement marking will be measured by the linear foot as provided in Section 8-23.4.

Water will be measured by the M gallon as provided in Section 2-07.4.

5-04.5 Payment

Payment will be made for each of the following Bid items that are included in the Proposal:

“HMA Cl. ___ PG ___”, per ton.

“HMA for Approach Cl. ___ PG ___”, per ton.

“HMA for Preleveling Cl. ___ PG ___”, per ton.

“HMA for Pavement Repair Cl. ___ PG ___”, per ton.

“Commercial HMA”, per ton.

The unit Contract price per ton for “HMA Cl. ___ PG ___”, “HMA for Approach Cl. ___ PG ___”, “HMA for Preleveling Cl. ___ PG ___”, “HMA for Pavement Repair Cl. ___ PG ___”, and “Commercial HMA” shall be full compensation for all costs, including anti-stripping additive, incurred to carry out the requirements of Section 5-04 except for

those costs included in other items which are included in this Subsection and which are included in the Proposal.

“Crack Sealing”, by force account.

“Crack Sealing” will be paid for by force account as specified in Section 1-09.6. For the purpose of providing a common Proposal for all Bidders, the Contracting Agency has entered an amount in the Proposal to become a part of the total Bid by the Contractor.

“Soil Residual Herbicide ___ ft. Wide”, per mile, or

“Soil Residual Herbicide”, per square yard.

The unit Contract price per mile or per square yard for “Soil Residual Herbicide” shall be full payment for all costs incurred to obtain, provide and install herbicide in accordance with Section 5-04.3(4)B.

“Pavement Repair Excavation Incl. Haul”, per square yard.

The unit Contract price per square yard for “Pavement Repair Excavation Incl. Haul” shall be full payment for all costs incurred to perform the Work described in Section 5-04.3(4)C with the exception, however, that all costs involved in the placement of HMA shall be included in the unit Contract price per ton for “HMA for Pavement Repair Cl. ___ PG ___”, per ton.

“Asphalt for Fog Seal”, per ton.

Payment for “Asphalt for Fog Seal” is described in Section 5-02.5.

“Longitudinal Joint Seal”, per linear foot.

The unit Contract price per linear foot for “Longitudinal Joint Seal” shall be full payment for all costs incurred to perform the Work described in Section 5-04.3(12)B.

“Planing Bituminous Pavement”, per square yard.

The unit Contract price per square yard for “Planing Bituminous Pavement” shall be full payment for all costs incurred to perform the Work described in Section 5-04.3(14).

“Temporary Pavement Marking”, per linear foot.

Payment for “Temporary Pavement Marking” is described in Section 8-23.5.

“Water”, per M gallon.

Payment for “Water” is described in Section 2-07.5.

“Job Mix Compliance Price Adjustment”, by calculation.

“Job Mix Compliance Price Adjustment” will be calculated and paid for as described in Section 5-04.3(9)A7, 5-04.3(9)B3, and 5-04.3(9)C1.

“Compaction Price Adjustment”, by calculation.

“Compaction Price Adjustment” will be calculated and paid for as described in Section 5-04.3(10)C3.

“Roadway Core”, per each.

The Contractor’s costs for all other Work associated with the coring (e.g., traffic control) shall be incidental and included within the unit Bid price per each and no additional payments will be made.

“Cyclic Density Price Adjustment”, by calculation.

“Cyclic Density Price Adjustment” will be calculated and paid for as described in Section 5-04.3(10)B.

STANDARD SPECS NEEDING REVISION OUTSIDE OF 5-04

1. Revise the requirements for the PG binder grade in Section 9-02.1(4) to provide that the binder shall meet the grade specified, and no other grade.
2. Will need to change "commercial" to "visual" in 9-03.8(7)
3. In 3-04: need to change the term "fine aggregate angularity" to "uncompacted void content".

9-04.2 Joint and Crack Sealants

9-04.2(1)A Hot Poured Sealant

9-04.2(1)A1 Hot Poured Sealant for Cement Concrete Pavement

Hot poured sealant for cement concrete pavement shall meet the requirements of ASTM D6690 Type IV, except for the following:

1. The Cone Penetration at 25°C shall be 130 maximum.
2. The extension for the Bond, non-immersed, shall be 100 percent.
3. Hot poured sealant shall have a minimum Cleveland Open Cup Flash Point of 205°C in accordance with AASHTO T 48.

9-04.2(1)A2 Hot Poured Sealant for Bituminous Pavement

Hot poured sealant for bituminous pavement shall meet the requirements of ASTM D6690 Type II and have a minimum Cleveland Open Cup Flash Point of 205°C in accordance with AASHTO T 48.

9-04.2(1)B Sand Slurry for Bituminous Pavement

Sand slurry is mixture consisting of the following components measured by total weight:

1. Twenty percent CSS-1 emulsified asphalt,
2. Two percent portland cement, and
3. Seventy-eight percent fine aggregate meeting the requirements of 9-03.1(2)B Class 2. Fine aggregate may be damp (no free water).

5-02.3(2)E Crack Sealing

Where shown in the Plans, seal cracks and joints in the pavement in accordance with Section 5-04.3(4)A1 and the following:

1. Cracks ¼ inch to 1 inch in width - fill with hot poured sealant.
2. Cracks and joints greater than 1 inch in width – fill with sand slurry.



WSDOT SOP 737

Procedure for the Forensic Testing of HMA Field Cores

1. Scope

This method describes the process for testing Hot Mix Asphalt (HMA) field cores for asphalt content, gradation, volumetric analysis, Hamburg Wheel-Test, Indirect Tensile Strength and asphalt binder grade determination.

1.1 This standard covers the procedural steps required for forensic testing of HMA field cores. Cores for forensic testing may range in size from 4-12 inches, although many specific test procedures require the core specimen to be six inches.

1.2 The values stated in English units are to be regarded as the standard.

2. Significance And Use

2.1 Approvals of the material for HMA are required prior to use per *Standard Specifications* Section 1-06.1.

2.2 Samples obtained in accordance with this procedure, shall be obtained using WSDOT SOP 734, "Sampling Hot Mix Asphalt after Compaction (Obtaining Cores)".

3. Reference Documents

Refer to applicable test methods within this procedure.

4. Apparatus

Refer to applicable test methods within this procedure.

5. Safety

This standard does not purport to address all of the safety concerns, associated with its use.

It is the responsibility of the user of this standard operating procedure to establish a pre activity safety plan prior to use.

6. Test Site Location

The sample location and quantity of cores to be obtained shall be determined by the test procedure to be performed or agency requirements.

7. Procedures

Perform procedures as needed to obtain desired test results:

- 7.1 Obtain cores per WSDOT SOP 734, "Sampling Hot Mix Asphalt after Compaction". The required quantity and size of cores for each procedure shall be as shown in Table 1:

Procedure	Size	Number of Cores	Special Instructions
AASHTO T331, "Standard Method of Test for Bulk Specific Gravity (Gmb) Density of Compacted Hot Mix Asphalt (HMA) Using Automatic Vacuum Sealing Method"	4" or 6"	1	
WSDOT FOP for AASHTO T209, "Theoretical Maximum Specific Gravity Density of Hot Mix Asphalt Paving Mixtures"	4" or 6"	1	
WSDOT FOP for AASHTO T308, "Determining the Asphalt Binder Content of Hot Mix Asphalt by the Ignition Method"	6"	1	
WSDOT FOP for AASHTO T27/11, "Mechanical Analysis of Extracted Aggregate"	6"	1	
WSDOT FOP for AASHTO T324, "Hamburg Wheel-Track Testing of Compacted Hot Mix Asphalt"	6"	2	Obtain cores 6" apart for each determination
WSDOT FOP for ASTM D6931, "Standard Test Method for Indirect Tensile Strength of Bituminous Mixtures"	6"	3	Obtain cores 6" apart for each determination
AASHTO R29, "Standard Practice for Grading or Verifying the Performance Grade (PG) of an Asphalt Binder"	6"	2	Obtain cores 6" apart for each determination

Table 1

- 7.2 Remove moisture from cores per AASHTO PP 75, "Vacuum Drying Compacted Asphalt Specimens" or ASTM D7227, "Rapid Drying of Compacted Asphalt Specimens Using Vacuum Drying Apparatus".
- 7.3 Determine core density per AASHTO T331, "Standard Method of Test for Bulk Specific Gravity (Gmb) and Density of Compacted Hot Mix Asphalt (HMA) Using Automatic Vacuum Sealing Method", and WSDOT FOP for AASHTO T209, "Theoretical Maximum Specific Gravity and Density of Hot Mix Asphalt Paving Mixtures". Theoretical Maximum Specific Gravity and Density of Hot Mix Asphalt Paving Mixtures data from corresponding field testing may be substituted in lieu of testing core material.

Note 1: AASHTO T331 shall be performed prior to WSDOT FOP for AASHTO T209. Before performing T209 all shaved or bare aggregate surfaces either from coring, surface wear or handling of the specimen shall be removed and separated from the specimen by carefully picking them from the specimen using a sharp tipped tool. Care must be taken not to remove fully coated aggregate. Removed particles shall be discarded and not included with the WSDOT FOP for AASHTO T209 test specimen.

- 7.4 Determine asphalt content per WSDOT FOP for AASHTO T308, "Determining the Asphalt Binder Content of Hot Mix Asphalt by the Ignition Method", if an ignition furnace correction factor (IFCF) is available. Otherwise, perform AASHTO T164, "Standard Method of Test for Quantitative Extraction of Asphalt Binder from Hot Mix Asphalt".
- 7.5 Determine aggregate sieve analysis per WSDOT FOP for AASHTO T27/11, "Mechanical Analysis of Extracted Aggregate". WSDOT FOP for AASHTO T27/11 shall be performed following binder extraction per WSDOT FOP for AASHTO T308, "Determining the Asphalt Binder Content of Hot Mix Asphalt by the Ignition Method" or AASHTO T164, "Standard Method of Test for Quantitative Extraction of Asphalt Binder from Hot Mix Asphalt".
- 7.6 Determine rutting and moisture-susceptibility of HMA per WSDOT FOP for AASHTO T324, "Hamburg Wheel-Track Testing of Compacted Hot Mix Asphalt".
- 7.7 Determine Indirect Tensile Strength (IDT) per WSDOT FOP for ASTM D6931, "Standard Test Method for Indirect Tensile Strength of Bituminous Mixtures".
- 7.8 Determine grade of asphalt per AASHTO R29, "Standard Practice for Grading or Verifying the Performance Grade (PG) of an Asphalt Binder". Extract the binder in accordance with AASHTO R59, "Recovery of Asphalt Binder from Solution by Abson Method" or ASTM D1856, "Standard Test Method for Recovery of Asphalt from Solution by Abson Method", for each asphalt grade determination.

Note 2: Binder specimens for AASHTO R29, Standard Practice for Grading or Verifying the Performance Grade (PG) of an Asphalt Binder may be obtained in conjunction with AASHTO T164, Standard Method of Test for Quantitative Extraction of Asphalt Binder from Hot Mix Asphalt.

WARM MIX ASPHALT SUBMITTAL

In accordance with WSDOT Standard Specifications Section 5-04.2 this submittal must be approved by the Engineer prior to production of WMA.

Contract Information

- Contract number
- HMA tons per bid item
 - WMA tons per bid item
 - HMA mix design ID number(s) to be used for production of WMA

Warm Mix Asphalt

- WMA technology description; organic additive, chemical additive and equipment used
 - Manufacturer's technical information
 - Recommendations for production of WMA
 - Material safety data sheets (MSDS) for additive if used
 - Contractor's target rate for water or additive
- Mixing temperature @ discharge
 - Manufacturer of the WMA technology
 - Recommended mixing temperature
 - Maximum mixing temperature
 - Mix design
 - Optimum mixing temperature
 - The optimum mixing temperature is provided on the mix design report
 - Maximum mixing temperature
 - The maximum temperature is the optimum mixing temperature +25°F per Section 5-04.3(8)
 - Contractor's mixing temperatures
 - Target mixing temperature
 - Maximum mixing temperature
 - The Contractor's maximum mixing temperature cannot exceed the manufacturer's maximum mixing temperature or the mix design maximum mixing temperature
- Target temperature for WMA @ paver laydown

Asphalt plant

- Location, type & model
- Equipment and/or modifications for WMA production
- RAP percentage (20% max.)
- Production rate

Truck Ticket

- The truck ticket shall identify the material produced as HMA or WMA

Dyer, Bob

From: Dave Gent - WAPA <dave.gent@asphaltwa.com>
Sent: Wednesday, October 07, 2015 4:56 PM
To: Dyer, Bob
Subject: 2015-10-09 Improving HMA Meeting Agenda - WAPA FAA Proposal(s)
Attachments: Std.Spec. 3-04 Table 2 WAPA Proposed FAA change.pdf; Aggregate Test Result Challenge Proposal 9.25.2015.docx

Bob,

This is what I shared with the WAPA group with respect to changing / modifying the FAA spec. You can share the concepts with the WSDOT Committee members.

I THINK the Table 2. Pay Factors would work, but you get the concept. Decrease the Pass/ Fail system now in place and replace with a sliding Pay Factor scale for FAA.

See you Friday morning!

Dave

This is what I'm thinking with respect to the FAA / Uncompacted Void Content proposal for a spec. change (fracture count (and SE) is also included to some extent) that is on the Improving HMA Committee agenda. Many thanks to Kentin, Logan and the Granite QC team for helping to review these proposals. The aggregate test result challenge proposal (attached) is largely Logan's effort:

- A. Option "A" – Simple/ more equitable: Decrease the Contingent Unit Price per Ton in 3-04, Table 1 from \$20.00 per ton to \$6.00 per ton, better reflecting aggregate production pricing. HMA is already subject to penalties for gradation, Va and compaction at full HMA unit pricing. Adding Aggregate Acceptance penalties at an inflated (delivered plus) price is not equitable and was never discussed with WAPA. Also allow for a contractor challenge for any of the properties in Table 2 (fracture, SE and uncompacted void content (aka FAA)). There is no current challenge system in place that I am aware of.
- B. Option "B" – Fairly simple and more equitable - See the attached proposed altered Table 2. Basically this proposal blunts making a 1% below minimum FAA such a huge hit. Adjusts the value of the FAA penalty to a sliding scale. As above, we should also allow for a contractor challenge for any of the properties in Table 2 (fracture, SE and uncompacted void content). Do we want to push for also having fracture and SE on a sliding scale?
- C. Option "C" – Most rational/ end result based option - See the Aggregate Test Result Challenge Proposal (attached). Summary: allow for challenging the fracture count or FAA penalty by using companion mix samples taken at the same time the cold feed samples were taken and testing for Hamburg rutting compliance. This could also be done using pavement cores, but that should not be necessary if companion HMA mix is collected when the cold feed samples are collected. If the HMA passes the rut tests, the FAA penalties would be reversed and the cost of testing would be borne by WSDOT. If the HMA mix fails the Hamburg tests, then the penalties would be enforced and the cost of the testing would be borne by the Contractor. It would be the Contractor's option to first challenge the actual Agg. Acceptance test(s) in this scenario to check for test accuracy.

Dave Gent

David Gent, P.E.

Aggregate Acceptance Test Result Challenge Proposal

- The Contractor will be informed of any test that fails any of the measured criteria for HMA Aggregate as soon as the test is completed by WSDOT. The Contractor has the option to challenge the failing test(s) using sample splits from the original test samples. If the re-test shows that the failing test(s) were inaccurate, no price adjustment(s) will be assessed.
- For any failing Fracture or Uncompacted Void Content tests, the Contractor may request a Hamburg test to remove failing test result price adjustments. When verification is required, a split of a subplot HMA sample from the same period as the Aggregate Acceptance subplot sample was taken must be sent to the State Materials Laboratory for Hamburg testing. The challenge sample will be tested for rutting and stripping by the Hamburg and results will be used for aggregate acceptance input into SAM. The cost of testing for the challenge test, if failing, will be deducted from any monies due or that may come due the Contractor under the contract at a rate of \$750 per challenge test. If the Hamburg challenge tests meet or exceed the mix design criteria, WSDOT will absorb the cost of the challenge tests.

Reasoning

- Currently at WSDOT there is no way to challenge a failing Aggregate Acceptance test. This challenge format would allow a path to challenge an Aggregate Acceptance test result by first challenging the test accuracy and then by using mix performance testing to prove whether the failing fracture or uncompacted void content tests have truly impacted the performance of the HMA being produced.
- Rutting failure in the asphalt layer is described by Superpave SP-2 as resulting from "an asphalt mixture without enough shear strength to resist repeated heavy loads." One way to increase this shear resistance is to select aggregates with a "high degree of internal friction-one that is cubical, has a rough surface texture, and is graded to develop particle-to-particle contact."
- Coarse aggregate angularity "ensures a high degree of aggregate internal friction and rutting resistance."
- Fine aggregate angularity "ensures a high degree of fine aggregate internal friction and rutting resistance."
- Uncompacted void content issues have been noted in national reviews of the method (Chowdhury et. al. 2001). "It has been found that...the FAA test method does not consistently identify angular, cubical aggregates as high quality materials. The basic test assumption is that more fractured faces will result in higher void content in the loosely compacted sample...This assumption is not always true."

While the WSDOT criteria for uncompacted void content was partially adjusted to account for this testing relevance uncertainty when WSDOT set the 9-03.8(2) minimum percent voids standards, Hamburg tests were not in place at that time. The Hamburg tests more directly provide predictive performance tests for individual HMA mixes. HMA aggregates, in isolation, should not be penalized if the final HMA products are performing above the Hamburg standards.

- Rutting is the only main distress that would be caused by improper angularity of aggregates.
- With higher percentages of RAP being used, less virgin aggregates are being used and evaluated in the Aggregate Acceptance testing methods. This results in skewed testing of the HMA aggregates as the RAP is not being accounted for in cold feed tests, which may account for as little as 50% of the aggregates in the mix in very high RAP HMA mixes. Hamburg testing more accurately predicts realistic HMA performance than simple aggregate acceptance tests, especially in the case of high RAP HMA mixes and should be allowed in lieu of penalizing HMA mixes that otherwise would pass Hamburg mix design criteria.

- Hamburg tests are run at WSDOT to ensure proper rutting and stripping performance of the mix. If cold feed samples fail aggregate testing but the Hamburg mixture performance test passes, it should be recognized as a better predictor of the overall HMA mix performance.

The reasoning above leads to the conclusions for allowing challenge testing of Aggregate Acceptance tests. It is a rational proposal that the cold feed aggregate testing of fine and coarse aggregate angularity results can be challenged, first by challenging the accuracy of the original tests and then by evaluation of the actual HMA by running Hamburg rut tests using HMA samples obtained at the same time as the Aggregate Acceptance subplot samples were taken.

Respectfully submitted,

WAPA Improving HMA subcommittee members

9/25/2015

**Table 2
Price Adjustment Factors**

Standard Specifications	Item	Maximum Size Sieve: 100% Pass	Nominal Maximum Size Sieve: 100% Pass ¹	Other Specifications Sieves #4 and Larger	Specification Sieves: #8 to #100	#200 Sieve	Sand Equivalent	Fracture ²	Other	
9-03.1	Concrete Aggregate (all concrete aggregate -including pavement)	2	2	2	10	20				
9-03.4(2)	Crushed Screening	2	2	5	5	20		15		
9-03.8(2)	HMA Aggregate						15	15		
				Uncompacted Void Content - 1% below design minimum - 2% below design minimum - 3% below design minimum						5 10 15
9-03.9(1)	Ballast	2	2	5	5	10	15		Dust Ratio 15	
9-03.9(2)	Permeable Ballast	2	2	5	5			15		
9-03.9(3)	Crushed Surfacing	2	2	5	5	10	15	15		
9-03.9(4)	Maintenance Rock	2	2	5	5	10	15	15		
9-03.10	Gravel Base		2	5		6	10		Dust Ratio 10	
9-03.11(1)	Streambed Sediment	2	2	5	5	10				
9-03.12(1)A	Gravel Backfill for Foundations Class A ³									
9-03.12(1)B	Gravel Backfill for Foundations Class B		2	5		6	10		Dust Ratio 10	
9-03.12(2)	Gravel Backfill for Walls	2	2	5		6	10		Dust Ratio 10	
9-03.12(3)	Gravel Backfill for Pipe Zone Bedding	2	2	5	5	6	10			
9-03.12(4)	Gravel Backfill for Drains	2	2	5		6				
9-03.12(5)	Gravel Backfill for Drywells	2	2	5		6				
9-03.13	Backfill for Sand Drains		2	5	3	10				
9-03.13(1)	Sand Drainage Blanket		2	5	3	10				
9-03.14(1)	Gravel Borrow	2	2	5	5	5	10			
9-03.14(2)	Select Borrow	2	2	5	5	6	10			
9-03.14(4)	Gravel Borrow for Structural Earth Walls	2	2	5	5	5	10		Other ⁴	
9-03.17	Foundation Material, Class A & B		2	3						
9-03.18	Foundation Material Class C	2		3						
9-03.19	Bank Run Gravel for Trench Backfill	2	2	5		6	10		Dust Ratio 10	
	Other Materials	2	2	5	5	10	15	15	Dust Ratio 10	

¹For Aggregate, the nominal maximum size sieve is the largest standard sieve opening listed in the applicable specification upon which more than 1-percent of the material by weight is permitted to be retained. For concrete aggregate, the nominal maximum size sieve is the smallest standard sieve opening through which the entire amount of aggregate is permitted to pass.

²Price adjustment factor applies where criteria is contained in the material specification.

³Use the price adjustment factors for the material that is actually used.

⁴Resistivity 10, pH 10, Chlorides 5, and Sulfates 5.