

PMPC Final Report Signature Page for Develop Post Production Gradation (PPG) for HMA Acceptance Specifications

Many efforts within the Pavement and Materials Partnering Committee (PMPC) require signature approval from the Executive Committee and Task Group members. This document provides final approval and close out by the Task Group and Executive Committee members for **Develop Post Production Gradation (PPG) for HMA Acceptance Specifications** work product and that the working group (WG) has met their commitments for the final report with documentation of decisions/implementation recommendation made. A signature here indicates that each Task group member and Executive Committee has reviewed the final report and agrees the WG has met final report criteria set out in the scoping document and SOP. Furthermore, it is everyone's responsibility to ensure that the final effort/improvement is:

- 1) Street Ready
- 2) Monitored and recorded for performance
- 3) Successfully implemented statewide as appropriate.

Subtask Task Group:

Caltrans Name (Recommendation)

Kee Foo
Kee Foo
Subtask Group Chair,
Pavement Program

08-01-2023

Date

Industry Name (Concurrence)

Tony Limas
Tony Limas
Industry Subtask Group Lead

08-01-2023

Date

Task Group:

Caltrans Name (Recommendation)

Cathrina Barros
Cathrina Barros
Caltrans Task Group Chair
Pavement Program

Date

Industry Name (Concurrence)

Pat Imhoff
Pat Imhoff
Industry Task Group Member

Date

Joseph Dongo
Joseph Dongo
Caltrans Task Group Member
Construction

Date

Phil Reader
Phil Reader
Industry Task Group Member

Date

Jacquelyn Wong
Jacquelyn Wong
Caltrans Task Group Member
Materials Engineering and Testing Services

Date

Scott Dmytrow
Scott Dmytrow
Industry Task Group Member

Date

Dennis McElroy
Dennis McElroy
Industry Task Group Member

Date

Executive Committee:

Caltrans Name (Recommendation)

Tom Pyle
Tom Pyle
Caltrans Executive Committee Chair
Pavement Program

Date

Industry Name (Concurrence)

Brandon Milar
Brandon Milar
Industry Executive Committee Member

Date

Raymond Tritt
Raymond Tritt
Caltrans Executive Committee Member
Construction

Date

Charley Rea
Charley Rea
Industry Executive Committee Member

Date

Sudhakar Vatti
Sudhakar Vatti
Caltrans Executive Committee Member
Structure Design

Date

Timothy Greutert
Timothy Greutert
Caltrans Executive Committee Member
Materials Engineering and Testing Services

Date



Asphalt Subtask Group WORK PRODUCT FINAL REPORT

For Post Production Aggregate Gradation in Hot Mix Asphalt



Principal Authors

M. Armanuse, Working Group Caltrans Chair
T. Limas, Working Group Industry Lead

August 1, 2023

Members of the Working Group

Post Production Gradation WPG		
CT/Industry	Division/Firm Name	Member Name
CT	METS	Maged Armanuse (CT Chair)
CT	HQ Construction	Ragu Thangavelautham
CT	Pavement Program	Saeed Pourtahmasb
CT	D3 Lab Manager	Jeff Herbert
CT	METS	Julia Rockenstein
CT	METS	Saman Barzegari
CT	D3 DME	Darwin Vargas
Industry	CalCIMA	Tony Limas (Industry Lead)
Industry	Sully Miller	Don Vivant
Industry	Vulcan Materials	Cameron Richardson
Industry	Knife River	Tim Denlay
Industry	Granite Construction	Vishal Jakkaraju
Industry	Vulcan Materials	David Ruedi

EXECUTIVE SUMMARY

Caltrans currently uses pre-plant aggregate samples to determine the aggregate gradation of Hot Mix Asphalt (HMA). State transportation agencies increasingly use post production aggregate gradations for the acceptance of Hot Mix Asphalt (HMA) under the assumption that post production gradations are more representative of HMA. The main objective of this project is to determine if Post Production gradations can be specified for the acceptance of HMA in California. This report describes a study that investigated the use of the use of Post Production aggregate gradations in lieu of pre-plant gradations.

BACKGROUND

Current Caltrans specifications rely on pre-plant aggregate samples to control the aggregate gradation of HMA. At the same time, the remaining HMA acceptance criterion including mix volumetrics, tensile strength, rutting and dust to asphalt ratio are based on post Production samples. The current practice (pre-plant analysis) can be problematic, as the pre-plant gradations do not capture potential aggregate breakdown associated with the mechanical and heating dynamics that occur during the asphalt plant production process.

Current Caltrans specifications rely on AASHTO T 27 (Standard Method of Test for Sieve Analysis of Fine and Coarse Aggregates), to determine the aggregate gradation of HMA sampled from pre-plant composite cold feed belt and hot bin samples.

In addition, when the HMA contains Reclaimed Asphalt Pavement (RAP), a mathematical calculation is used to determine the combined gradation of the virgin and RAP aggregates, whereas the Post Production aggregate gradation provides a more realistic representation of the gradation.

Initially, the use of pre-plant aggregate gradations was specified in the design and acceptance of plant produced HMA using the Hveem mix design methodology. At that time, the use of pre-plant gradations was not an issue because acceptance of plant produced HMA did not include mixture volumetrics. With the adoption of the SuperPave mix design methodology in 2014, volumetric properties and the dust to asphalt ratio were included as asphalt mixture design and acceptance criteria. This change precipitated the need for post production aggregate gradations since mix volumetric are measured on the post production asphalt mixture.

Caltrans and Industry researched the practice used by other Departments of Transportation (DOTs) to determine the extent at which other DOT's use post production aggregate gradations for acceptance testing. Caltrans conducted an independent survey finding that the majority of state DOT's (91 percent) use post production aggregate gradation for acceptance of HMA mixtures.

Caltrans and their Industry partners worked together to determine which test method(s) should be included in the pilot projects. It was determined that AASHTO T 308 (Standard Method of Test for Determining the Asphalt Binder Content of Hot Mix Asphalt (HMA) by the Ignition Method), and AASHTO T 30 (Standard Method of Test for Mechanical Analysis of Extracted Aggregate), should be used since these test methods (with or without some modification) are currently being used by most DOTs to determine post production aggregate gradations.

The post production Gradation Work Product Group (WPG) came to consensus on the non-Standard Specification (nSSP) and the selection criteria for pilot projects. Several projects were identified and either were bid with the non-standard specification or a no-cost Contract Change Order (CCO) was issued after award. Among those projects, a total of six projects have generated and submitted viable data during the 2022 construction season.

EA	County & Route	Aggregate Source	CT Testing Lab
02-1J4604	SIS-96	Northstate Asphalt	D2
02-1J4704	TRI-3	Fawndale	D2
02-2J4104	THE-36	Fawndale	D2
05-1M0104	MON-68	Granite - Salinas	D5
05-1N6904	SLO-101	SPM Templeton	D5
10-1N0704	MER-33	Teichert Tracy	D10

The pilot project data collected indicates that post production aggregate gradation quality control (QC) and acceptance testing will produce test results that are more representative of the material produced at the HMA plant. Using post production gradations for acceptance will also reduce the overall testing time and effort by eliminating the need to perform individual hot-bin gradations for HMA batch plants and mathematically combined virgin/RAP aggregate gradations for HMA drum plants. Per current industry standards, asphalt and aggregate ignition furnace correction factors established for each ignition furnace are used for binder and/or aggregate gradation testing. The pilot project data evaluated revealed no identifiable patterns to raise concerns related to the use of post production aggregate gradations for HMA quality control and acceptance testing.

Work Product Group Deliverables

The post production Aggregate Work Product Group met on a regular basis to discuss the following deliverables:

- Test method selection and modification options for post production aggregate gradation analysis
- Specification modifications to implement the move to post production aggregate gradation acceptance.

The following report outlines the analysis, decisions, recommendations, and final work products developed by the Post production Aggregate Gradation Work Product Group.

Test Methods Reviewed

- AASHTO T 30, "Standard Method of Test for Mechanical Analysis of Extracted Aggregate"
- AASHTO T 308, "Standard Method of Test for Determining the Asphalt Binder Content of Asphalt Mixtures by the Ignition Method"

Selection of AASHTO T 30 and AASHTO T 308

Following a literature review and review of other State Department of Transportations' (DOT) and FHWA practices, the WPG determined that AASHTO T 30 and AASHTO T 308 should be adopted as the test methods for aggregate gradation analysis and asphalt extraction, respectively. The following sections summarize the reasoning behind the selection of AASHTO T 30 and AASHTO T 308 and each recommended modification.

After researching other DOT's practices, it was found that 31 of State DOTs utilize post-production gradation for acceptance testing. It was found that nearly all the surveyed DOTs utilize AASHTO T 308 or some modified version of AASHTOT 308 for the mechanical analysis of the aggregates. Additional information about the conducted survey can be found in Appendix D.

Caltrans requires AASHTO T 30 for mechanical analysis of the RAP aggregate in the current Specifications. The WPG proposed use of AASHTO T 30 for aggregate gradation acceptance for the HMA mix.

Caltrans also currently uses AASHTO T 308 for determining the asphalt binder content of HMA mixes. The WPG agreed to apply the correction factors across all acceptance sieves in lieu of the specific sieves noted in Section A2.9.2 and Table A2.1 of AASHTO T 308-19.

The WPG agreed to use the same sieves as used for RAP acceptance testing.

The WPG also agreed that the training and certification for AASHTO T 30 should emphasize that mechanical washing of aggregates should follow the test method precisely to ensure mechanical washing does not breakdown the aggregate further affecting the final gradations.

Justification for Specification Changes

Modifications to Section 39 of the Standard Specifications are required to implement the post production gradation acceptance testing. These modifications are shown in Summary of Changes, Appendix C.

Pilot Project Selection Criteria

The WPG developed the following criteria for pilot projects:

- Projects should cover all California regions– coastal, northern, southern, and central,
- Projects should use Non-Statistical Pay Factor (SPF),
- Projects should include approximately 10,000 tons HMA,
- Some of the projects should include lime-treated aggregates,
- Some of the projects should include rubberized asphalt mixes.

The WPG worked directly with Districts to select the projects for the pilot study.

The WPG reached consensus to go directly to pilot projects to collect data as opposed to running gradations outside of regular projects. This saved time and money as both Caltrans and Industry currently use AASHTO T 308 for determining binder content. Substituting AASHTO T 30 for gradation analysis and running AASHTO T 27 took about the same testing time required for running AASHTO T 27.

In addition, pilot project and/or specification issues, if any, were identified and corrected prior to full project implementation.

It should be noted that HMA mix design requirements were not modified through this change, and only the acceptance testing for gradations was changed from cold feed gradations to post production gradations.

Data Evaluation Plan

The Data evaluation team reviewed the aggregate gradation results from the pilot projects to interpret the data and identify patterns that may suggest a change in the acceptance criteria or test method is needed. Pilot project gradations appeared comparable to the variances seen with pre-plant aggregate gradation results. The pilot project data evaluated revealed no identifiable patterns to raise concerns related to the use of post production aggregate gradations for HMA quality control and acceptance testing.

Stakeholders feedback

- DMEs and lab managers acknowledged their ability to perform the post production aggregate acceptance testing if they receive equipment and training as noted in the lab survey responses, Appendix L.2
- FHWA concurs with using this aggregate gradation acceptance method for contract compliance.

PPG Implementation Plans

To ensure seamless implementation of the proposed acceptance criteria, WPG looked at the following issues.

1. Execute Independent Assurance (IA) implementation plan (Appendix L.1) to certify labs and testers in AASHTO T 30 and incorporation of the change into Joint Training Program.
2. Purchase and install required equipment for Caltrans labs as listed in the survey responses. (Appendix L.2)
3. Develop a Construction Procedure Directive (CPD) to allow use of specification prior to formal implementation (Appendix L.4).
4. Add the nSSP to the Standard Specifications (Appendix F).
5. Notify contractors and construction of the change to post production aggregate gradation acceptance testing through issuing a CPD (Appendix L.6).

Refer to Appendix L for details of the Implementation Plans.

Implementation of these tasks is beyond the scope of this WPG. The WPG decided it is beneficial to have this document in place to provide the background information required to successfully implement the specification change.

RECOMMENDATIONS

While numerous decisions were based on the above analysis and contributed to the proposed specification changes, the WPG concluded that HMA acceptance aggregate gradations should be based on post production asphalt samples for the following reasons:

- The post production aggregate gradation best represents the aggregate gradation of the final product.
- Asphalt mixtures volumetrics and performance test properties are based on post production asphalt samples.
- The use of post production aggregate gradations significantly reduce the time and effort associated with individual gradations tests performed on pre-production aggregate and reclaimed asphalt pavement at HMA plants.

We recommend using AASHTO T-308 and AASHTO T-30 for determining post production gradation for acceptance purposes. Proposed specification change can be found in Appendix F.

The use of post production samples to determine aggregate gradations increases the level of complexity in the design, production, and acceptance of HMA. Efforts to minimize and/or account for aggregate breakdown during mix production may include:

- Adjusting the pre-plant aggregate gradation as needed to meet the mix design gradation target values on post production asphalt samples.
- Use of dust control systems as need to account for fines in the asphalt mixture.

While not part of the milestones of this WPG, Caltrans and Industry agreed to include the following additional recommendation to the Spec owner for consideration and implementation:

- Removing the 375°F max aggregate temperature requirement in Section 39-2.01B(8)(a) of Standard Specifications. Additional information about this recommendation can be found in Appendix J.

Recommendations for Future Improvements:

Industry shared additional concerns and recommendations that are outside the scope of this WPG. This section summarizes these concerns, which need to be discussed in the subtask group level for further action:

- 1 Change LA Rattler from 40 to 45 max.
- 2 Remove requirement to fractionate RAP.
- 3 Remove RAP augmentation requirements.
- 4 Eliminate MPQP requirements related to skimmers, knock out box and cyclones.

In addition, Industry and Caltrans agreed that removal of “Voids in Mineral Aggregates (VMA) on laboratory produced HMA” requirements for acceptance testing from Specifications (refer to Appendix M.2 for more information), be further evaluated in the Asphalt Subtask Group.

Additional information about these recommendations can be found in Appendix J and Appendix K.

Maged Armanuse

08-01-2023

Maged Armanuse, PE
Branch Chief
QASI Bay Area Branch
Office of Structural Materials
Materials Engineering and Testing Services
Division of Engineering Services

Tony Limas

08-01-2023

Tony Limas
Director of Asphalt Advocacy & Technical
Affairs
California Construction and Industrial
Materials Association

References

1. AASHTO T 308-18, "Standard Method of Test for Determining the Asphalt Binder Content of Hot Mix Asphalt (HMA) by the Ignition Method."
2. AASHTO T 30-19, "Standard Method of Test for Mechanical Analysis of Extracted Aggregate"

Appendices:

- Appendix A - PMPC Scoping Document
- Appendix B - Non-Standard Special Provisions (NSSP) for Pilot Projects
- Appendix C - Specification Summary of Changes
- Appendix D - Survey of State DOTs Aggregate Gradation Acceptance Method
- Appendix E - Post production Gradation Forms
- Appendix F - Proposed Revised Standard Specifications
- Appendix G - Pilot Project List
- Appendix H - Pilot Project Test Results
- Appendix I - Industry Review of Pilot Project Test Results
- Appendix J – Industry’s Concerns and Recommendations for Future Work
- Appendix K – Recommendations Regarding Voids in Mineral Aggregates (VMA) in Lab-produced HMA
- Appendix L - PPG Implementation Plans
 - L.1 - IA Implementation Plan and Task Email
 - L.2 - Caltrans Labs and Implementation Workplan
 - L.3 - DIME Implementation Plan (Ongoing)
 - L.4 - Proposed CPD
 - L.5 - Construction Manual Update
 - L.6 - Industry Implementation Plan
- Appendix M - Outreach Records
 - M.1 - Fact sheets
 - M.2 - FHWA
 - M.3 - DMEs
 - M.4 - Lab Managers for District and Field Labs

Appendix A– PMPC Scoping Document

PPG WPG developed the following Scoping Document as the initial Milestone for this effort. The Scoping document was reviewed and approved by representatives of Caltrans and Industry.

Pavement & Materials Partnering Committee

Work Product Scoping Document

Post Production Aggregate Gradation in Hot Mix Asphalt

June 10th, 2020

Task Group

Asphalt Task Group/Asphalt Subtask Group

Title

Post Production Aggregate Gradation in Hot Mix Asphalt

Problem Process

- ☒ Annual
☐ Expedited
☐ Emerging Initiative

Statement of Effort/Improvement

Aggregate gradation before hot mix asphalt (HMA) production (pre-plant gradation) is different from aggregate gradation after HMA production (post-plant gradation) due to aggregate breakdown during the HMA plant production process. The degree of aggregate breakdown is related to the thermal and mechanical stresses exerted on the aggregate during HMA production as well as the aggregate's resistance to breakdown. Specifications of plant produced HMA materials should be based on post-plant aggregate gradation because:

- HMA volumetric is based on post-plant materials
- Post-plant gradation is the closest gradation to the final product
- Post-plant gradation is more representative than mathematically combined gradation of RAP and virgin aggregate.

FHWA stated that majority of states use post-plant gradation. Ninety-one percent of the states that responded to our survey use post plant-gradation. However, Caltrans currently uses pre-plant gradation in the calculation of plant produced HMA volumetric properties (ie. voids in mineral aggregate, dust-binder ratio) resulting in higher values than post plant gradation. These differences increased the level of complexity in the design, production, and acceptance of HMA. Attempts to minimize and/or account for aggregate breakdown to pre-plant gradation include:

- Limiting the aggregate production temperature to minimize aggregate breakdown
- Adjusting pre-plant aggregate gradation
- Accounting for up to 1.5% passing #200 materials from breakdown during production. Assuming 1% drop in voids in mineral aggregate (VMA) in plant produced HMA due to aggregate breakdown

Purpose

The purpose of the PMPC work product group is to improve the mix design and HMA acceptance specification by replacing the pre-plant aggregate gradation with post-plant aggregate gradation. Current attempts to minimize and/or account for aggregate breakdown in pre-plant aggregate gradation are then no longer required.

Background

Initially, pre-plant aggregate gradation was specified in the design and acceptance of plant produced HMA (Hveem) mixes. Pre-plant gradation is not an issue because acceptance of the plant produce HMA was not based on HMA volumetric.

In 2014, full HMA volumetric requirements were adopted with the implementation of Superpave mix design. Therefore, it is time to replace pre-plant aggregate gradation with the appropriate post-plant aggregate gradation.

Approach

1. Street Ready Assurance

This effort proposed moving aggregate gradation measurement from pre-plant production to post-plant production with minimal anticipated impact to HMA quality, construction, and production, and therefore, is expected to be street ready. An Independent Assurance implementation plan will be developed. Related forms and guidance will also be updated. The test frequency for gradation remain unchanged. Gradation testing is performed at post-plant instead of pre-plant without introducing new test method. The testing turnaround time will be longer if ignition oven test and extracted gradation test are performed at district central laboratory.

2. Performance Tracking/Management

The Asphalt STG will monitor feedback during the pilot projects and the recommended specification changes received from both Caltrans and Industry. The Asphalt STG will submit a report to ATG after 1 year of implementation.

3. Consistently Implemented

The WPG will perform outreach to District counterparts via the District Materials Engineers and HQ Construction with the goal to provide them with current

information and to seek input throughout the nSSP creation and implementation process.

4. Pilot Projects (if anticipated)

Twenty pilot projects are recommended to evaluate the nSSP before statewide implementation. The WPG will select the pilot projects to be evenly distributed statewide. Pilot projects must be asphalt paving projects with aggregate gradation requirements. The WPG will create the pilot project workplan and oversee the pilots to evaluate their success and lessons learned. The work plan will address the following key aspects of successful implementation:

- IA Program changes - Either provisional certification for any new tests or incorporation in the JTCP.
- DIME modifications to address any data input.
- Changing any construction forms.

5. Research Needs (if necessary)

No research need is anticipated. UCPRC will be consulted if there is any unforeseen research needs.

Team Members (Indicate CT Chair and Industry Lead)

CT/Industry	Division/Firm Name	Member Name
CT	METS	Maged Armanuse (CT Chair)
CT	HQ Construction	Ragu Thangavelautham
CT	Pavement Program	Saeed Pourtahmasb
CT	D3 DME	Darwin Vargas
Industry	Granite Construction	Tony Limas (Industry Lead)
Industry	Vulcan Materials	Cameron Richardson
Industry	Sully Miller	Don Vivant
Industry	Knife River	Tim Denlay

Team should not include no more than 4 Caltrans staff and 4 members from Industry. See PMPC Standard Operating Procedures for more information.

Objectives/Deliverables/Due Dates

The expected deliverables for implementing Post Plant Gradation are:

- Conduct a literature review of relevant research, FAA practices and other DOT practices
- Identify a test method to measure aggregate gradation after HMA production (Post Plant).
- Develop Post Plant Gradation NSSP
- Implement Post Plant Gradation NSSP on pilot projects and gather data

Pavement & Materials Partnering Committee
 Scoping Document
 Asphalt Task Group/Asphalt Subtask Group
 Post Production Aggregate Gradation in Hot Mix Asphalt
June 10th, 2020

- Analyze aggregate gradation preplant versus aggregate gradation post plant
- Modify aggregate specification requirements from preplant to post plant.
- Submit RSS to Office of Construction Standards (OCCS)

Details:

Milestones	Name - Responsible Party	Due Date (Start/Complete)*
Literature and Practice Review	METS Rep and Industry Lead	06/01/20 - 12/01/20
Identify Test Method	METS Rep and Industry Lead	06/01/20 – 12/01/20
Develop Post Plant NSSP	Pvt Rep and Industry Lead	12/01/20 - 03/01/21
Update Mix Design Forms and DIME Entry	Construction and METS Rep and Industry Lead	12/01/20 - 03/01/21
Provisional Certification or Incorporation in the JTCP	METS Rep and Industry Lead	12/01/20 - 03/01/21
Develop Pilot Projects Work Plan	Cons Rep and Industry Lead	03/01/20 – 06/01/21
Data collection and evaluation	CT Chair and Industry Lead	06/01/21 - 03/01/22
Post Plant Gradation Specification	Pvt Rep and Industry Lead	03/01/22 – 06/01/22
Submit RSS to OCCS	Pvt Rep	04/15/22 – 07/01/22

*Dates will be adjusted based on EC approval of the scoping document

Resources To Develop and Implement (Staff hours and expenses.)

	Caltrans Hours	Industry Hours
Literature and Practice Review	200	200
Identify Test Method	50	50
Post plant gradation NSSP	100	100
Pilot projects	100	40

Forms Update and DIME Input	50	50
Data collection and evaluation	200	100
Post plant gradation specification	100	100
Submit RSS to OCCS	50	5
Other Resources	300	300

Benefits

The following benefits are expected from the completion of this effort:

- Post plant gradations will be closer to laboratory mix design target values than the mathematically combined gradation of RAP and virgin aggregate.
- Improved control of asphalt mixture properties.
- Allows easier incorporation of RAP, RAS and alternative materials into mix designs.

Estimated Impact to Caltrans and Contractor -

- Specification requirements for aggregate gradation is shifted from preplant to post plant.
- Requires training and IA certification.

Impediments to Completion of Deliverables –

Available Caltrans staff and industry resources to perform necessary tasks in connection with completion of project.

- Securing resources to conduct post plant aggregate gradation at pilot projects.

Pavement & Materials Partnering Committee
 Scoping Document
 Asphalt Task Group/Asphalt Subtask Group
 Post Production Aggregate Gradation in Hot Mix Asphalt
 June 10th, 2020

Recommendation and Approval

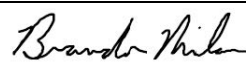
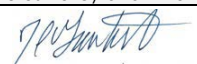
This scoping document for Post Production Aggregate Gradation was prepared by Asphalt Subtask Group to address a priority issue with statewide significance and is within the Pavement & Materials Partnering Committee mission as described in the Pavement & Materials Partnering Committee Charter. The Subtask Group members have determined the scope, resources required and timeline for delivery of this project to attempt to ensure that the deliverables are achievable. A signature here indicates that each Task Group and PMPC Executive Committee is committed to providing the resources to support this effort within the prescribed timeframes. Furthermore, it is everyone's responsibility to ensure that the final effort/improvement will be:

- 1) Street-Ready,
- 2) Monitored and reported for performance,
- 3) Successfully implemented statewide as appropriate.

Scoping Document Recommendation and Industry Concurrence by (name and date):

Caltrans Name (Recommendation)	Date	Industry Name (Concurrence)	Date
	6/29/20		6/29/20
Tom Pyle, Caltrans Task Group Chair		Pat Imhoff, Industry Task Group Lead	
	6/29/20		6/29/20
Ken Solak, Caltrans Task Group Member		Phil Reader, Industry Task Group Co-Member	
	6/29/20		
Tim Greutert, Caltrans Task Group Member			

Scoping Document Approval and Industry Concurrence by (name and date):

Caltrans Name (Approval)	Date	Industry Name (Concurrence)	Date
	7/17/20		7/17/20
Sergio Aceves, Caltrans PMPC Executive Committee – Chair Pavement Program		Brandon Milar, Industry PMPC Executive Committee	
	7/17/20		7/17/20
Ray Hopkins, Caltrans PMPC Executive Committee Headquarters Construction		Charley Rea, Industry PMPC Executive Committee	
	7/17/20		
Dolores Valls, Caltrans PMPC Executive Committee Structures Policy and Innovation			
	7/17/20		
Tim Greutert, Caltrans PMPC Executive Committee Materials Engineering and Testing Services			

Approval Date: 7/17/20



Appendix B – Non-Standard Special Provisions (NSSP) for Pilot Projects

WPG drafted the following NSSP for inclusion in the projects that were part of the Pilot program. The NSSP was either included as part of the contract Special Provisions at the time of bidding or were added to the project requirements through a Contract Change Order (CCO).

Replace *AASHTO T 308* at each occurrence in Section 39 with:

AASHTO T 308 (Modified)

Add to the table in the 5th paragraph of section 39-2.01A(1)

AASHTO T 30	2019
-------------	------

Add after the 2nd paragraph of section 39-2.01A(4)(a)

AASHTO T 308 (Modified) is AASHTO T 308 with the following parameters:

Replace Section A2.9.2 with:

Determine the average difference for the two values. The aggregate correction factors (equal to the resultant average differences) for all sieves shall be applied to all acceptance gradation test results determined by T 30, prior to final rounding and reporting.

Replace *the first* paragraph of section 39-2.01B(4)(b) with:

Test for aggregate gradation under AASHTO T 30.

Add to the table in the 1st paragraph of section 39-2.02A(4)(b)(ii)

Gradation	AASHTO T 27	Once per day – Report only
-----------	-------------	----------------------------

Replace *AASHTO T 27* in the row for gradation in the table in the 1st paragraph of section 39-2.02A(4)(b)(ii) with:

AASHTO T 30

Delete footnote a in the table in the 1st paragraph of section 39-2.02A(4)(b)(ii)

Replace *AASHTO T 308* in the row for *Asphalt Binder Content* in the table in the 1st paragraph of section 39-2.02A(4)(b)(ix) with:

AASHTO T 308 (Modified)

Replace *AASHTO T 27* in the row for *Aggregate gradation* in the table in the 1st paragraph of section 39-2.02A(4)(e) with:

AASHTO T 30

Delete footnote a in the table in the 1st paragraph of section 39-2.02A(4)(e)

Replace *AASHTO T 27* in the row for *Aggregate gradation* in Item 1 of the table of section 39-2.03A(4)(c)(iii) with:

AASHTO T 30

Replace *AASHTO T 27* in the row for *Aggregate gradation* in the table in item 1 in the list in the paragraph of section 39-2.03A(4)(e)(i) with:

AASHTO T 30

Replace *AASHTO T 27* in the row for *Aggregate gradation* in the table in item 1 in the list in the paragraph of section 39-2.04A(4)(c)(i) with:

AASHTO T 30

Appendix C – Specification Summary of Changes

Section (Version)	Section 39 (2018)	Proposed nSSP (2021)
Various locations throughout specification.	AASHTO T27	Change from current acceptance criteria of AASHTO T27 to AASHTO T30 (2019) in various locations.
39-2.01B(4)(b) Aggregate Gradations	Aggregate gradation must be determined before the addition of asphalt binder and must include supplemental fine aggregates. Test for aggregate gradation under AASHTO T 27. Do not wash the coarse aggregate. Wash the fine aggregate only. Use a mechanical sieve shaker. Aggregate shaking time must not exceed 10 minutes for each coarse and fine aggregate portion. Choose a TV within the TV limits shown in the tables titled "Aggregate Gradations." Gradations are based on nominal maximum aggregate size.	Test for aggregate gradation under AASHTO T 30. Choose a TV within the TV limits shown in the tables titled "Aggregate Gradations." Gradations are based on nominal maximum aggregate size.
39-2.02A(4)(b)(ii) Aggregates	Aggregate Testing Frequencies Table Gradation Test Method AASHTO T 27 Footnote a: If RAP is used, test the combined aggregate gradation under California Test 384.	Add to AASHTO T 27: "Once per day - Report only." Add Gradation Test method AASHTO T 30 Delete footnote a.
39-2.02A(4)(b)(iii) Reclaimed Asphalt Pavement		CT will check with Kee Foo for new language. IF change is approved, we can swap for new language. Otherwise keep as is. Incorporated.
39-2.02A(4)(e) Department Acceptance	Aggregate Quality Table: Footnote a: The Engineer determines combined aggregate gradations containing RAP under California Test 384.	Delete footnote a.
39-2.02A(4)(e) Department Acceptance	2.If RAP is used, RAP quality requirements shown in the following table:	Keep The same language.
39-2.02A(4)(e) Department Acceptance	Type A HMA Acceptance In Place Table	Keep language as is and re-visit after pilot projects.

Section (Version)	Section 39 (2018)	Proposed nSSP (2021)
39-2.02B (2) Type A Hot Mix Asphalt Mix Design	The mix design for Type A HMA must comply with the requirements shown in the following table: Type A HMA Mix Design Requirements	Keep language as is and re-visit after pilot projects when we have data. Industry feels they will be trending toward the upper limit on the 200 sieve which may impact volumetrics and dust proportion.
39-2.02B(4)(b) Aggregate Gradations	Aggregate gradation must be within the TV limits for the specified sieve size shown in the following tables: Aggregate Gradations for Type A HMA (percent Passing)	Industry suggest footnote that would increase the -200 sieve by 1% when lime is used since lime addition increases fines in the mix . Volumetrics and dust proportion to control. Added footnote a. Update. Spec owner had comments, group agreed to leave as is with option to revisit after pilot projects.
39-2.03B (2) Rubberized Hot Mix Asphalt – Gap Graded Mix Design	RHMA-G Mix Design Requirements Table	Keep language as is and re-visit after pilot project data.
39-2.03B(4)(b) Aggregate Gradations	For RHMA-G, the aggregate gradations must be within the TV limits specified in the following tables: Aggregate Gradations for RHMA-G (Percentage Passing)	Industry has reviewed data and will keep the language and re-visit after pilot projects.
39-2.04B(4)(b) Aggregate Gradations	For OGFC, the aggregate gradations must be within the TV limits for the specified sieve size shown in the following tables: Aggregate Gradations for OGFC (Percentage Passing)	Industry has reviewed data and will keep the language and re-visit after pilot projects.
Various locations throughout specification.	AASHTO T 308, Method A	AASHTO T 308 (Modified), Method A This applies correction factors to all sieves.
39-2.01A(4)(a) General	Add Test Method Modification language.	AASHTO T 308 (Modified) is AASHTO T 308 with the following parameters: Determine the average difference for the two values. The aggregate correction factors (equal to the resultant average differences) for all sieves shall be applied to all acceptance gradation test results determined by T 30, prior to rounding and reporting.

Appendix D– Survey of State DOTs Aggregate Gradation Acceptance Method

WPG performed a comprehensive survey among the different State DOTs across the country to determine the current practice regarding the mix design and HMA acceptance specification. The survey was conducted through review of Standard Specifications, Standards and Forms, and direct enquiry from the states.

Results of the survey demonstrated that 39 of states (78% of states) are currently using some form of post production Gradation as part of their HMA acceptance process, while 11 States do not use post production gradations. Of those DOTs that use PPG, 64% (25) use AASHTO T 30 or some modification of AASHTO T 30. The remaining 36% (14) use their own test method/lab procedure. These test methods/lab procedures could also be modifications of AASHTO T 30. A side-by-side comparison of the methods has not been done at this time. Most DOTs that use PPG for pay factors only use a couple of sieves for a pay factor. Some DOTs use correction factors for the 200 sieve.

State	PPG (Y/N)	Method	Test Method	Acceptance	Pay Factor	Quality Testing	Correction Factor	Notes
AL	Yes	Extraction /Ignition	Not Stated	Yes	QC/QA projects only	Yes	No	
AR	Yes	Extraction /Ignition	ARIZ 201 or ARIZ 427 (modified AASHTO 308) or ARIZ 428	Yes	Yes	Yes		
FL	Yes	Ignition	FM 1-T 030 (modified AASHTO T 30)	Yes	No	Yes		
IL	Yes	Ignition	Illinois Procedure	Yes - not on gradation	No	Yes		
IN	Yes	Extraction	ITM 571 (AASHTO T 30)	Yes	Yes - not on gradation	Yes	Yes	Certified suppliers
KY	Yes	Extraction or ignition	KM 64-433	Yes	Yes	Yes	No	
LA	Yes	Extraction or Ignition	TR 309	Yes	No	Yes	No	
MD	Yes	Ignition	Not clear	Yes	No	Yes	No	

State	PPG (Y/N)	Method	Test Method	Acceptance	Pay Factor	Quality Testing	Correction Factor	Notes
KS	No	NA	KT-2 (AASHTO T-27)		Yes	Yes	NA	The absolute value of the deviation between the acceptance test results and the design job-mix single point will be determined for the #4, #8, #30 and #200 sieve, whichever results in the greatest price reduction.
ME	Yes	Either	AASHTO T-30	Yes	Yes	Yes	No	
MI	No	NA	AASHTO T-27	Yes	No	Yes	NA	
MT	Yes	Ignition	MT 320 (Modified AASHTO T-30)	Yes	Yes	Yes	Yes	
NE	Yes	Either	AASHTO T-30	Yes	Yes	Yes	No	
NV	No	NA	NEV T206G	Yes	No	Yes	No	
NH	Yes	Extraction	AASHTO T-30	Yes	Yes	Yes	No	
NJ	No	NA	AASHTO T-27	No	No	Yes	NA	
NC	No	NA	AASHTO T-27	No	No	Yes	NA	
MA	Yes	Ignition	AASHTO T 30; AASHTO T 308	Table 450.65-2	Yes			Section 450
MS	Yes	Ignition	AASHTO T 308		Yes			Section 400 (237)
MO	No							
NY	No	Plant Automation	MP 401 (AASHTO T 27)	Table 401-1	Yes			Section 400 (310)

State	PPG (Y/N)	Method	Test Method	Acceptance	Pay Factor	Quality Testing	Correction Factor	Notes
ND	Yes	Ignition		Table 420-01; 430.04 Section M	For density	Yes		Section 430 (236)
OK	Yes	Ignition	AASHTO T 30	708.04 D; Table 708.13	Yes			Section 411 (218)
PA	Yes	Ignition	PTM 757; 739 (AASHTO T 30)	Yes	Yes			
SC	Yes	Ignition	SC-T-102	SC-M-400	No			Section 401 (188)
CO	No							
AK	Yes	Ignition	ATM 304; ATM 406 (mod T 308); ATM 408 (mod T 30)	Yes (131)	Yes			
AZ	Either	Ignition or Nuclear	ARIZ 201 or Ariz 427 (modified AASHTO 308) or ARIZ 428 (RAP)					2008 spec
CT	Yes	Ignition	AASHTO T 30	Yes (Page 506)	No			
DE	Yes	Ignition	AASHTO T 30 (Page 523)					
GA	Yes	Ignition/E xtraction	GDT 38 (Page 297)	Yes	Yes (Page 304)			
HI	Either	Ignition						
ID	Yes	Ignition	AASHTO T 30 (Page 196, Table 405.03-3)	Yes (Page 197)	No	Yes (Page 199)		
TN	Yes	Ignition/E xtraction (P347)	AASHTO T 164, AASHTO T 308, AASHTO T 30 (P347)	Yes	Yes-Page 347			
TX	Yes	Ignition (P246)	Tex-236-F	Yes (Page 249)	Not for Gradation		Tex-236-F	
VA	Yes	Ignition		Yes (Page 207)				http://www.virginia.gov/business/materials-default.asp

State	PPG (Y/N)	Method	Test Method	Acceptance	Pay Factor	Quality Testing	Correction Factor	Notes
								http://www.virginia.gov/business/materials/default.asp
WA	Yes	Ignition-Extraction	FOP for AASHTO T 30/T 11 (Page 362)		Yes-Page 363			
WI	No							
IA	Either	Ignition	https://www.iowadot.gov/erl/current/IM/content/338.htm https://www.iowadot.gov/erl/current/IM/content/338.htm		No		https://www.iowadot.gov/erl/current/GS/content/2303.htm https://www.iowadot.gov/erl/current/GS/content/2303.htm	https://iowadot.gov/specifications/ https://iowadot.gov/specifications/
NM	Yes	Ignition (P233)	AASHTO T308	No	No			
MN	Yes	Ignition/Extraction	MnDOT Lab. Manual 1853 Appendix/1203.5	Yes (Page 211- G14.g)	Yes (Page 211- Table 2360-18)		Yes- MnDOT Lab. Manual 1853 Appendix (Page 202)	
OH	Yes	Ignition/Extraction (P245)	Supplement 1054/AC Gauge test	No	No	Yes- Table 441.10-1 (Page 248)		
OR	Yes	Ignition (P 813)	AASHTO T30	Yes (00744.17) Page 813	Yes-Page 845			
RI	Yes	Page 181	Not listed	Table 2, Section 401.02.4 (Page 181)	Not for Gradation	Yes (Bottom of Page 181)		
SD	No							
UT	Not clear				Yes (Table 1, Page 404)			

State	PPG (Y/N)	Method	Test Method	Acceptance	Pay Factor	Quality Testing	Correction Factor	Notes
VT	Yes	Ignition/E xtraction	AASHTO T 30, AASHTO T 164, AASHTO T 308	No	Not for Gradati on	Yes (Table 406.03I, Page 190)		
WV	Either	Ignition/E xtraction	T308	Yes	Yes			WV DOT Document MP 401.02.29 - 5.2)
WY	Yes	Extraction (P270)	Wyoming 414 (Modified T308)	No	Yes (Section 401.5.4, P304)	Yes (Page 269, 401.4.7. 3.3)		

Appendix E– Post Production Gradation Forms

WPG adapted the FHWA Form 1648 (Worksheet for Ignition Furnace Binder Correction Factor and Worksheet for Ignition Furnace Binder Correction Factor and Aggregate Gradation Correction Factor for Mixes Including RAP) for the pilot program study. The FHWA forms 1640 and 1648 was updated into two separate forms, for mixes with or without RAP, to determine the correction factors during the pilot study. The updated forms were then updated based on the feedback from Industry and were assigned DOT form numbers CEM-3503 and CEM-3504, respectively. These CEM forms will then become available through Caltrans website for contractors to access and for optional use. These forms include an optional batching sheet, which contractors can utilize to record the batching information during testing.

POST PLANT GRADATION CORRECTION FACTOR FOR HOT MIX ASPHALT

DOT CEM-3503 (NEW 03/2023)

CONTRACTOR NAME AND ADDRESS	CONTRACT NUMBER/COUNTY/ROUTE/POSTMILE	
	PROJECT IDENTIFIER NUMBER	
PHONE NUMBER	PROJECT INFORMATION/NAME	
SUBMITTED BY CONTRACTOR (PRINT NAME AND SIGN)		DATE

Source:	Hot Mix Asphalt (HMA) Type:	
Sample ID:	Date:	
Target Binder Content, Percent By Mass of Mix:	Tested By:	
Test Temperature, Degrees Celsius (°C):		
Ignition Furnace Manufacturer:	Serial #:	Location of Furnace:
	Trial #1	Trial #2
(A) Initial "buttered" bowl mass, g		
(B) Final bowl mass, g		
(C) Bowl mass difference, (B – A), g		
(D) Dry aggregate mass, g		
(E) Aggregate & binder mass, g		
(F) Binder mass, (E – D), g		
(G) Corrected binder mass, (F – C), g		
(H) Actual binder content by mixture mass, (G / (D + G) * 100), %		
(I) Sample basket assembly mass, g		
(J) Sample basket assembly & mix mass, g		
(K) Mix mass, (J – I), g		
(L) Ignition furnace binder content, % by mass of mix		
(M) Correction factor, (L – H), %	L1	L2
(N) Average correction factor, ((L1 + L2) / 2), % (see Note)	Average	
(O) Difference in correction factor, (L1 – L2), %	Difference	

Note: L1 and L2 are the ignition furnace binder content, percent by mass of mix, for Trial 1 and 2 respectively.

Remarks



POST PLANT GRADATION CORRECTION FACTOR FOR HOT MIX ASPHALT

DOT CEM-3503 (NEW 03/2023)

Source:

Hot Mix Asphalt (HMA) Type:

Sample ID:

Date:

Target Binder Content, Percent By Mass of Mix:

Tested By:

Test Temperature, Degrees Celsius (°C):

Ignition Furnace Manufacturer:

Serial #:

Location of Furnace:

Aggregate Gradation Correction Factor (Percent Passing)

Sieve Size	Trial #1	Trial #2	"Washed Blank"	Trial #1 Difference	Trial #2 Difference	Average Difference
1"						
3/4"						
1/2"						
3/8"						
#4						
#8						
#30						
#50						
#100						
#200						

☐ Handwash ☐ Mechanical Wash Time:

Remarks

PROOF COPY
RETURN TO HQ FORMS

OK X _____
DATE _____



POST PLANT GRADATION CORRECTION FACTOR FOR HOT MIX ASPHALT WITH RECYCLED ASPHALT PAVEMENT

DOT CEM-3504 (NEW 03/2023)

CONTRACTOR NAME AND ADDRESS		CONTRACT NUMBER/COUNTY/ROUTE/POSTMILE	
		PROJECT IDENTIFIER NUMBER	
PHONE NUMBER		PROJECT INFORMATION/NAME	
SUBMITTED BY CONTRACTOR (PRINT NAME AND SIGN)			DATE
Source:	Date:		
Sample ID:	Tested By:	Test Temperature (°C):	
Target Binder Content:	Binder Content, Recycled Asphalt Pavement (RAP):		
Ignition Furnace Manufacturer:	Serial #:	Location of Furnace:	
	Trial #1	Trial #2	
(A) Initial "battered" bowl mass, g			
(B) Final bowl mass, g			
(C) Bowl mass difference, (B – A), g			
(D) Mass RAP, g			
(E) Mass of RAP Aggregate, (D) – (D * (RAP / 100)), g			
(F) Mass of RAP Binder, (D * (RAP / 100)), g			
(G) Dry Virgin Aggregate mass, g			
(H) Virgin Binder mass			
(I) Total Binder mass, (F + H), g			
(J) Corrected binder mass, (I – C), g			
(K) Actual binder content by mixture mass, (J / (D + G + H) * 100), %			
(L) Sample basket assembly mass, g			
(M) Sample basket assembly & mix mass, g			
(N) Mix mass, (M - L), g			
(O) Ignition furnace binder content by mass of mix, %			
(P) Correction factor, (O – K), %	P1	P2	
(Q) Average correction factor, ((P1 + P2) / 2), % (see Note)	Average		
(R) Difference in correction factor, (P1 – P2), %	Difference		

Note: P1 and P2 are the calculated correction factor, (O-K), % for trial 1 and trial 2 respectively.

Remarks



POST PLANT GRADATION CORRECTION FACTOR FOR HOT MIX ASPHALT WITH RECYCLED ASPHALT PAVEMENT

DOT CEM-3504 (NEW 03/2023)

Source:		Date:	
Sample ID:	Tested By:	Test Temperature (°C):	
Target Binder Content:		Binder Content, Recycled Asphalt Pavement (RAP):	
Ignition Furnace Manufacturer:		Serial #:	Location of Furnace:
Mix Composition, Percent Mass of Mix:	Virgin Aggregate (Agg):	RAP:	
Mix Composition, Percent Mass of Agg:	Virgin Agg:	RAP Agg:	

Aggregate Gradation Correction Factor

(American Association of State Highway and Transportation Officials T 30, Sieve Analysis, Percent Passing)

Sieve Size	Trial #1	Trial #2	Virgin Agg Gradation "Washed Blank"	Burned RAP Agg Gradation "Washed Blank"	Calculated "Washed Blank"	Trial #1 Difference	Trial #2 Difference	Average Difference
1"								
3/4"								
1/2"								
3/8"								
#4								
#8								
#30								
#50								
#100								
#200								

☐ Handwash ☐ Mechanical Wash Time:

Remarks

PROOF COPY
RETURN TO HQ FORMS

OK X _____
DATE _____



Appendix F – Proposed Revised Standard Specifications

Based on the feedback from Industry, the WPG proposed the following language to be incorporated in the Revised Standard Specifications to standardize the PPG as the acceptance criteria for the future Caltrans Projects.

Replace AASHTO T 308 at each occurrence in Section 39 with:
AASHTO T 308 (Modified)

Add to the table in the 5th paragraph of section 39-2.01A(1)

AASHTO T 30	2019
-------------	------

Add after the 2nd paragraph of section 39-2.01A(4)(a)

AASHTO T 308 (Modified) is AASHTO T 308 with the following parameters:

Batch samples down to No.8 sieve.

Replace No. 40 sieve with No.100 sieve.

Replace Section A2.9.2 with:

Determine the average difference for the two values. The aggregate correction factors (equal to the resultant average differences) for all sieves shall be applied to all acceptance gradation test results determined by T 30, prior to final rounding and reporting.

Replace AASHTO T 27 in paragraph 5 of section 39-2.01A(4)(h)(i) with:

AASHTO T 30

Replace AASHTO T 27 in paragraph 8 of section 39-2.01A(4)(i)(j) with:

AASHTO T 30

Replace the first paragraph of section 39-2.01B(4)(b) with:

Test for aggregate gradation under AASHTO T 30.

Add to the table in the 1st paragraph of section 39-2.02A(4)(b)(ii)

Gradation	AASHTO T 27	Once per day—Report only
-----------	-------------	--------------------------

Replace AASHTO T 27 in the row for gradation in the table in the 1st paragraph of section 39-2.02A(4)(b)(ii) with:

AASHTO T 30

Delete footnote a in the table in the 1st paragraph of section 39-2.02A(4)(b)(ii)

Replace AASHTO T 308 in the row for Asphalt Binder Content in the table in the 1st paragraph of section 39-2.02A(4)(b)(ix) with:

AASHTO T 308 (Modified)

Delete item 1 in the 4th paragraph of section 39-2.02A(4)(b)(iii)

Replace *AASHTO T 27* in the row for Aggregate *gradation* in the table in the 1st paragraph of section 39-2.02A(4)(e) with:

AASHTO T 30

Delete footnote a in the table in the 1st paragraph of section 39-2.02A(4)(e)

Replace *AASHTO T 27* in the row for Aggregate *gradation* in Item 1 of the table of section 39-2.03A(4)(c)(iii) with:

AASHTO T 30

Replace *AASHTO T 27* in the row for Aggregate *gradation* in the table in item 1 in the list in the paragraph of section 39-2.03A(4)(e)(i) with:

AASHTO T 30

Replace *AASHTO T 27* in the row for Aggregate *gradation* in the table in item 1 in the list in the paragraph of section 39-2.04A(4)(c)(i) with:

AASHTO T 30

Appendix G – Pilot Project List

To evaluate the performance of the PPG acceptance criteria, a set of Pilot projects were selected. These projects encompassed variety of geographic, climatic, and aggregate sources. Below, is the list of the projects in pilot study program.

Post production Gradation Pilot Project Testing

1. Testing technicians shall need to contact Caltrans Independent Assurance for test proficiency certification in AASHTO T-308 (modified) and AASHTO T-30 unless the lab is AMRL accredited.
Testers need to ensure that mechanical washing is observed and stopped when water is clear or when maximum washing time is reached, whichever occurs first.
2. During Job Mix Formula (JMF) verification, the post production gradation correction factors need to be established from the binder correction factor material. The grading correction factors must be determined for each ignition oven used for post production gradation testing. Both the contractor and Caltrans will determine aggregate correction factors for each JMF.
3. AASHTO T-308 (modified per the project specifications) and AASHTO T-30 shall be used for determination of the correction factors and the aggregate gradations for each individual sieve. How you treat RAP currently is how you will treat the plant produced mix except you will use the corrections established during the JMF verification and not the contractor supplied correction factors. Testing frequency shall be per project specifications. For CALTRANS Acceptance Testing: Cold feed samples will not be needed except for running SE or other aggregate quality tests. A little more work at JMF verification time to establish correction factors but should reduce the workload during acceptance testing.
Batch and correct back to the “as received sample” gradation. For acceptance testing, determine the binder content per AASHTO T 308, then wash and grade the aggregates per AASHTO T 30, applying said correction factors.
4. Electronic Forms: CT version 1640 or CT version 1648 (RAP mixes) shall be used to report the aggregate correction factors. QC and QA aggregate grading test results are to be reported to the RE in the normally accepted forms/formats.
5. Data shall be submitted to the RE who will forward electronic copies to the PPG Working Group representative: Julia.Rockenstein@dot.ca.gov

Please feel free to call Julia Rockenstein at 858-302-7651 if you have any questions.

District	EA	Route	County	Pavement Type	Scope of work	Construction Season	CCO or Bid	Data used in Pilot Study
2	02-1J4704	3	Trinity	3/8" Type A	0.1' HMA overlay w/digouts	2021	CCO	Yes
5	05-1M0104	68	MON	RHMA	0.1 ft RHMA Overlay	2021	CCO	Yes
2	02-1J4604	96	Siskiyou	3/8" Type A	0.1' HMA overlay w/digouts	2021	CCO	Yes
1	01-0K9704	20 & 101	Men	HMA-A & RHMA-G	0.15' Cold Plane and RHMA-G	2022	Bid (verified)	No
2	02-2J3904	44	Shasta	3/8" Type A	0.1' HMA overlay w/digouts	2022	Bid (verified)	No
2	02-2J4104	36	Tehama	3/8" Type A	0.1' HMA overlay w/digouts	2022	Bid (verified)	Yes
10	10-1N0704	33	MER	Type A	R&R HMA Type A	2022	Bid	Yes
4	04-0W3604	114	SM	HMA-A	0.2' R&R	2022	Bid	No
4	04-1W9404	260	ALA	HMA-A	0.2' R&R	2022	Bid	No
5	05-1N7004	166	SLO	RHMA	Cold In-Place Recycling	2022	Bid	No
5	05-1N6904	101	SLO	RBWC	0.10' BWC-G	2022	Bid (verified)	Yes
9	09-386104	395	MNO	HMA-A	0.15' Thin Blanket Overlay	2022	Bid	No
9	09-388604	395	INY	HMA-A	0.10' Thin Blanket Overlay	2022	Bid	No
9	09-388804	58	KER	HMA-A & RHMA-G	Thin Blanket Overlay	2022	Bid	No
11	11-423804	125	SD	HMA-A & RHMA-G	Pavement Rehabilitation	2022	Bid (addendum)	No
11	11-430514	15	SD	HMA-A & RHMA-G	CRCP & HMA	2022	Bid (addendum)	No

Appendix H - Pilot Project Test Results

The following tables present summary of QC and QA test results for projects in the pilot program.

02-1J4704 0.375" 25% RAP Lime								
Sample Date			5/19/2021	5/19/2021	5/20/2021	5/20/2021	5/20/2021	5/20/2021
Sieve	Operating Range	Target	210 Tons Combined	771 Tons Combined	208 Tons Combined	208 Tons T-30 Grading	781 Tons Combined	781 Tons T-30 Grading
1"			100	100	100	100	100	100
3/4"			99	100	100	100	100	100
1/2"			100	100	100	100	100	100
3/8"	92-100	97	95	96	96	96	96	97
#4	58-68	63	63	65	65	63	63	63
#8	33-43	38	36	38	39	37	39	39
#30	11-21	16	15	15	16	16	16	16
#50			10	10	11	12	11	12
#100			7	7	8	8	7	9
#200	4.7-8.7	6.7	5.5	5.5	5.9	6.5	5.7	6.6

Sample Date			5/21/2021	5/21/2021	5/24/2021	5/24/2021	5/24/2021	5/24/2021
Sieve	Operating Range	Target	251 Tons Combined	251 Tons T-30 Grading	250 Tons Combined	250 Tons T-30 Grading	950 Tons Combined	950 Tons T-30 Grading
1"			100	100	100	100	100	100
3/4"			100	100	100	100	100	100
1/2"			100	100	100	100	100	100
3/8"	92-100	97	95	98	96	96	96	96
#4	58-68	63	65	70	64	67	66	68
#8	33-43	38	38	43	38	38	38	36
#30	11-21	16	16	18	15	15	15	15
#50			10	13	10	10	10	10
#100			8	9	8	7	7	6
#200	4.7-8.7	6.7	5.5	7.2	5.8	5.5	5.8	5.6

Sample Date			5/25/2021	5/25/2021	5/25/2021	5/25/2021	5/26/2021	5/26/2021
Sieve	Operating Range	Target	300 Tons Combined	300 Tons T-30 Grading	950 Tons Combined	950 Tons T-30 Grading	300 Tons Combined	300 Tons T-30 Grading
1"			100	100	100	100	100	100
3/4"			100	100	100	100	100	100
1/2"			100	100	100	100	100	100
3/8"	92-100	97	96	98	96	98	96	98
#4	58-68	63	65	66	64	65	63	65
#8	33-43	38	37	38	37	39	37	38
#30	11-21	16	13	15	14	15	14	15
#50			10	10	8	10	9	10
#100			7	7	6	6	7	7
#200	4.7-8.7	6.7	5	5.1	5.1	5.3	4.6	5.4

Sample Date			5/26/2021	5/26/2021	5/27/2021	5/27/2021
Sieve	Operating Range	Target	1000 Tons Combined	1000 Tons T-30 Grading	140 Tons Combined	140 Tons T-30 Grading
1"			100	100	100	100
3/4"			100	100	100	100
1/2"			100	100	100	100
3/8"	92-100	97	97	95	96	96
#4	58-68	63	61	58	62	62
#8	33-43	38	37	33	34	34
#30	11-21	16	14	14	14	14
#50			9	9	10	10
#100			7	6	7	7
#200	4.7-8.7	6.7	4.8	4.6	5.8	5.8

02-2J4104 0.375 HMA 25% RAP				
Sample Date			6/20/2022	6/22/2022
Sieve	Operating Range	Target	QA Lot 1/Sub 3	QA Lot 1/Sub 5
1"	100	100	100	100
3/4"	100	100	100	100
1/2"	100	100	100	100
3/8"	92-100	98	95.7	96.4
#4	58-68	66	61.9	60.9
#8	33-43	41	38.9	37.3
#30	11-21	18	17.7	22.8
#50			12.7	12.7
#100			9.6	9.8
#200	4.7-8.7	7	7.5	7.6

02-1J4604 0.375" 24% RAP Lime								
Sample Date			6/21/2021	6/21/2021	6/22/2021	6/22/2021	6/23/2021	6/23/2021
Sieve	Operating Range	Target	410 Tons Corrected	1010 Tons Corrected	264 Tons Corrected	1190 Tons Corrected	541 Tons Corrected	1260 Tons Corrected
1"	100	100	100	100	100	100	100	100
3/4"	100	100	100	100	100	100	100	100
1/2"	100	100	100	100	100	100	100	100
3/8"	93-100	98	100	100	100	100	100	100
#4	61-71	66	66	64	60	65	62	66
#8	36-46	41	41	39	38	40	39	42
#30	13-23	18	18	17	18	17	18	18
#50			13	13	13	13	13	14
#100			10	9	10	9	10	10
#200	5-9	7	7.3	7.2	7.5	7.1	7.3	7.9

10-1N0704 0.75" HMA RAP								
Sample Date			8/29/2022	9/7/2022	8/30/2022	9/7/2022	8/31/2022	9/7/2022
Sieve	Operating Range	Target	Lot 1/Sub 1	QA Lot 1/Sub 1	Lot 1/Sub 2	QA Lot 1/Sub 2	Lot 1/Sub 3	QA Lot 1/Sub 3
1"	100	100	100	100	100	100	100	100
3/4"	93-100	100	100	101.4	98	102.8	100	100.2
1/2"	79-91	100	92	88.4	86	83.4	89	83
3/8"		98	79	74.8	73	68.6	72	68
#4	43-53	66	54	50.3	49	46.5	47	46.2
#8	29-39	41	33	31.8	32	29	31	31.2
#30	9-17	18	11	11.5	12	9.2	12	11.7
#50			8	7.2	8	5	8	7.2
#100			5	5.2	4	2.4	5	5.3
#200	1-5	7	3.3	1	2.7	3.3	3.3	3.7

10-1N0704 0.50" HMA RAP						
Sample Date			9/15/2022			
Sieve	Operating Range	Target	Lot 1/Sub 1	Lot 1/Sub 2	Lot 1/Sub 3	Lot 1/Sub 4
1"	100	100	100	100	100	100
3/4"	93-100	98	100	101.4	98	102.8
1/2"	79-91	85	92	88.4	86	83.4
3/8"			79	74.8	73	68.6
#4	43-53	48	54	50.3	49	46.5
#8	29-39	34	33	31.8	32	29
#30	9-17	13	11	11.5	12	9.2
#50			8	7.2	8	5
#100			5	5.2	4	2.4
#200	1-5	3	3.3	1	2.7	3.3

05-1M0104 0.5" RHMA-G					
Sample Date			7/26/2021		
Sieve	Operating Range	Target	T-27 QC Lot 1-1	T-30 QC Lot-1-1	T-30 QA Lot 1-1 PSU
1"	100	100	100	100	100
3/4"	100	100	100	100	100
1/2"	92-100	98	99	99	96
3/8"	81-91	86	82	82	80
#4	25-37	31	30	30	29
#8	9-19	14	13	13	15
#30		6	6	6	8
#50		4	4	4	6
#100		2	2	2	4
#200	0-4	2	1	1	3

Sample Date			7/27/2021					
Sieve	Operating Range	Target	T-27 QC Lot 1-2	T-30 QC Lot 1-2	T-30 QA Lot 1-2	T-27 QC Lot 1-3	T-30 QC Lot 1-3	T-30 QA Lot 1-3
1"	100	100	100	100	100	100	100	100
3/4"	100	100	100	100	100	100	100	100
1/2"	92-100	98	100	99	98	100	98	99
3/8"	81-91	86	85	91	87	85	93	87
#4	25-37	31	33	34	37	33	42	35
#8	9-19	14	15	14	17	16	19	16
#30		6	9	5	9	8	8	8
#50		4	5	4	7	6	6	13
#100		2	3	3	5	4	4	4
#200	0-4	2	2	1.8	3.6	2.2	2.9	3.2

Sample Date			7/28/2021					
Sieve	Operating Range	Target	T-27 QC Lot 1-4	T-30 QC Lot 1-4	T-30 QA Lot 1-4	T-27 QC Lot 1-5	T-30 QC Lot 1-5	T-30 QA Lot 1-5
1"	100	100	100	100	100	100	100	100
3/4"	100	100	100	100	100	100	100	100
1/2"	92-100	98	100	98	96	100	97	97
3/8"	81-91	86	84	89	81	84	86	82
#4	25-37	31	34	35	32	33	32	31
#8	9-19	14	16	16	16	15	16	16
#30		6	8	8	9	7	8	9
#50		4	6	6	6	5	6	7
#100		2	4	4	5	3	4	5
#200	0-4	2	2.5	3.1	3.6	1.8	2.9	4.2

Sample Date			7/28/2021					
Sieve	Operating Range	Target	T-27 QC Lot 1-6	T-30 QC Lot 1-6	T-30 QA Lot 1-6	T-27 QC Lot 1-7	T-30 QC Lot 1-7	T-30 QA Lot 1-7
1"	100	100	100	100	100	100	100	100
3/4"	100	100	100	100	100	100	100	100
1/2"	92-100	98	100	97	98	100	99	99
3/8"	81-91	86	85	87	80	87	93	87
#4	25-37	31	30	29	27	29	30	30
#8	9-19	14	14	15	13	14	15	14
#30		6	7	8	8	8	8	9
#50		4	5	6	6	5	6	7
#100		2	3	5	4	3	4	5
#200	0-4	2	1.9	3.6	3.4	2	3	3.6

Sample Date			8/1/2021					
Sieve	Operating Range	Target	T-27 QC Lot 1-8	T-30 QC Lot 1-8	T-30 QA Lot 1-8	T-27 QC Lot 1-9	T-30 QC Lot 1-9	T-30 QA Lot 1-9
1"	100	100	100	100	100	100	100	100
3/4"	100	100	100	100	100	100	100	100
1/2"	92-100	98	100	98	98	100	99	98
3/8"	81-91	86	86	90	86	87	90	84
#4	25-37	31	30	31	29	31	30	27
#8	9-19	14	14	15	14	14	14	13
#30		6	7	7	7	6	7	7
#50		4	5	5	5	4	5	6
#100		2	3	4	4	3	4	4
#200	0-4	2	2	2.9	3.3	1.9	2.8	3.3

Sample Date			8/1/2021			8/2/2021		
Sieve	Operating Range	Target	T-27 QC Lot 1-10	T-30 QC Lot 1-10	T-30 QA Lot 1-10	T-27 QC Lot 1-11	T-30 QC Lot 1-11	T-30 QA Lot 1-11
1"	100	100	100	100	100	100	100	100
3/4"	100	100	100	100	100	100	100	100
1/2"	92-100	98	100	99	98	100	99	98
3/8"	81-91	86	86	94	88	85	87	85
#4	25-37	31	29	36	32	30	30	29
#8	9-19	14	14	16	16	13	15	13
#30		6	7	8	9	6	7	7
#50		4	5	6	7	4	5	6
#100		2	3	4	6	3	4	4
#200	0-4	2	2	2.8	4.7	1.6	2.6	3.2

Sample Date			8/2/2021					
Sieve	Operating Range	Target	T-27 QC Lot 1-12	T-30 QC Lot 1-12	T-30 QA Lot 1-12	T-27 QC Lot 1-13	T-30 QC Lot 1-13	T-30 QA Lot 1-13
1"	100	100	100	100	100	100	100	100
3/4"	100	100	100	100	100	100	100	100
1/2"	92-100	98	100	99	99	100	97	99
3/8"	81-91	86	86	89	87	85	85	87
#4	25-37	31	29	30	31	30	29	30
#8	9-19	14	13	14	14	14	14	15
#30		6	6	7	8	7	7	8
#50		4	4	5	6	5	6	6
#100		2	3	4	5	3	4	5
#200	0-4	2	1.8	2.6	3.9	1.8	3.1	3.6

Sample Date			8/3/2021					
Sieve	Operating Range	Target	T-27 QC Lot 1-14	T-30 QC Lot 1-14	T-30 QA Lot 1-14	T-27 QC Lot 1-15	T-30 QC Lot 1-15	T-30 QA Lot 1-15
1"	100	100	100	100	100	100	100	100
3/4"	100	100	100	100	100	100	100	100
1/2"	92-100	98	100	99	99	100	99	98
3/8"	81-91	86	84	87	88	85	91	86
#4	25-37	31	29	30	31	29	32	28
#8	9-19	14	12	15	14	14	15	13
#30		6	5	7	7	8	7	7
#50		4	4	5	6	5	5	5
#100		2	2	4	4	3	4	4
#200	0-4	2	1.3	2.6	3.3	2	2.8	2.9

05-1N6904 0.5" RHMA-O WMA							
Sample Date		8/11/2022		8/14/2022		8/15/2022	
Sieve	Operating Range	QC L1/SL1	PSU	QC L1/SL2	22-A-198	QC L1/SL3	22-A-199
3/4"	100	100	100	100	100	100	100
1/2"	89-100	94	96	94	95	93	96
3/8"	76-88	86	84	79	79	83	85
#4	21-35	34	31	30	26	30	28
#8	10-20	16	18	14	17	15	17
#30	0-8	6	6	5	5	6	5
#50		5	4	4	4	4	3
#100		3	3	3	3	3	2
#200	0-3.5	2.6	2.1	2.1	1.9	2.3	1.5

Sample Date		8/16/2022				8/17/2022	
Sieve	Operating Range	QC L1/SL4	22-A-200	QC L1/SL5	22-A-201	QC L1/SL6	22-A-202
3/4"	100	100	100	100	100	100	100
1/2"	89-100	95	94	98	95	96	95
3/8"	76-88	82	79	88	82	85	83
#4	21-35	27	24	31	28	29	27
#8	10-20	13	16	15	16	14	16
#30	0-8	5	5	6	5	5	5
#50		4	3	4	3	4	3
#100		3	2	3	2	3	2
#200	0-3.5	2.2	2	2.2	1.8	2.1	1.6

Sample Date		8/18/2022		9/11/2022		9/12/2022	
Sieve	Operating Range	QC L1/SL7	22-A-203	QC L1/SL8	22-A-234	QC L1/SL9	22-A-235
3/4"	100	100	100	100	100	100	100
1/2"	89-100	96	95	94	95	92	92
3/8"	76-88	86	79	86	84	80	76
#4	21-35	30	25	32	29	30	25
#8	10-20	14	15	15	19	15	16
#30	0-8	5	5	6	6	6	5
#50		4	3	4	4	4	4
#100		3	2	3	3	3	3
#200	0-3.5	2.1	1.5	2.5	2.1	2.5	1.9

Sample Date		9/13/2022		9/14/2022	9/15/2022	
Sieve	Operating Range	22-A-237	22-A-238	22-A-239	22-A-240	22-A-241
3/4"	100	100	100	100	100	100
1/2"	89-100	93	94	94	91	94
3/8"	76-88	76	78	78	75	79
#4	21-35	25	25	25	24	27
#8	10-20	16	15	16	16	16
#30	0-8	6	5	5	6	5
#50		4	4	4	4	4
#100		3	3	3	3	3
#200	0-3.5	2.1	2	2.1	2.5	1.9

Sample Date		9/20/2022			
Sieve	Operating Range	QC L1/SL16	22-A-242	QC L1/SL17	22-A-243
3/4"	100	100	100	100	100
1/2"	89-100	94	92	94	94
3/8"	76-88	80	75	84	77
#4	21-35	28	24	28	23
#8	10-20	14	15	13	14
#30	0-8	6	6	5	5
#50		5	4	4	4
#100		4	3	3	3
#200	0-3.5	2.5	2.2	2.2	1.9

Sample Date		9/21/2022				9/25/2022
Sieve	Operating Range	QC L1/SL18	22-A-244	QC L1/SL19	22-A-245	22-A-247
3/4"	100	100	100	100	100	100
1/2"	89-100	95	94	96	96	94
3/8"	76-88	83	76	88	86	78
#4	21-35	29	24	33	30	25
#8	10-20	14	16	19	20	16
#30	0-8	6	6	8	7	6
#50		4	4	6	5	4
#100		3	3	4	4	3
#200	0-3.5	2.4	2.4	3.2	2.8	1.9

Appendix I – Industry Review of Pilot Project Test Results

This appendix summarizes the industry analysis of pilot project test results.

Findings:

1. There were 2 Pay Factor sieves out of spec (QA) 0.2% fine and 0.7% fine on the No. 200
2. There were two test results where the QA T 30 test results were coarser than the contractors T 27 results leading to concerns that the rock corrections might not have been performed correctly or not applied on this project. They were both on the 3/8 sieve (non-pay factor)
3. There were a few discrepancies in terms of not knowing the source of the testing (T27, QC or QA)

Caltrans' response: Specification did not require T 27 reporting for every test. If not identified, assume it was T 30.

4. Maged asked from the industry whether they think additional pilot projects are required, and industry responded that they believe the current data is sufficient, and they want to add the

Summary of test results:

1. Project 02-1J4704 0.375" with 25 % RAP & lime

1. All QC/QA test in spec

2. Project 02- 1J4604 0.375" 24% RAP & Lime

1. All QC/QA test in spec

3. Project 05-1M0104 0.5" RHMA-G

1. QA result on 3/8" sieve was 2 percent coarser than the T27 and QC test results. (1.0 % coarse by spec)
2. QA result on No. 200 sieve was 1.3 percent finer than QC test results. (0.2 % fine by spec)
3. QA result on 3/8" sieve was 7 percent coarser than QC test results. (1.0 % coarse by spec)
4. QC result on 3/8" sieve was 6 percent finer than QA test results. (2.0 % fine by spec)
5. QA result on No. 200 sieve was 0.7 percent finer than QC test results. (0.7 % fine by spec)

Caltrans' response: Project totals: Two QA results on the 3/8" sieve were out of spec, three QC results on the 3/8" sieve were out of spec. Two QA results on the No. 200 sieve were out of spec.

4. Project 10-1N0704 0.75" HMA RAP

1. 1/2" sieve was 1 percent coarse by spec (not sure if test is T27 or QC)
2. No. 4 sieve 1 percent coarse by spec (not sure if test is T27 or QC)

Caltrans' response: Project totals: One QC results on the 1/2" sieve was out of spec, one QC result on the No. 4 sieve was out of spec.

Specification only required a once daily reporting of T 27 results. Assume results are T 30 per specification. Test result on spreadsheet not labeled QA is QC result.

5. Project 10-1N0704 05" HMA RAP

1. 3/8" 1.2 percent fine by spec (not sure if test is T27, QC or QA)
2. No.4 sieve 1.1 percent fine by spec (not sure if test is T27, QC or QA)
3. 3/8" 1.8 percent fine by spec (not sure if test is T27, QC or QA)
4. No.4 sieve 3.0 percent fine by spec (not sure if test is T27, QC or QA)

Caltrans' response: Project totals: Two QA results on the 3/8" sieve was out of spec, two QA results on the No. 4 sieve was out of spec.

Only QA results were received.

6. Project 02-2J4104 0.375" HMA 25% RAP

1. All QC/QA test in spec

7. Project 05-1N6904 0.5" RHMA-0 WMA

1. All QC/QA test in spec

Aggregate Gradation Correction Factor

1. Hongbin Xie shared concern mentioning there are gaps in the data we received in that the data did not include the calculations for the correction factors or correction factor work sheets.

Caltrans' response: Correction factor worksheets were available to all projects that were bid with the specification. Some projects did submit correction factor worksheets. These were supplied to all working group members.

2. Industry suggested providing a standard method for performing the aggregate gradation correction factor batching sheet to eliminate potential variability between different testing locations and ensure aggregate breakdown is taken into consideration. Industry believes this change would only improve the quality of the data, which already seems good.
3. Caltrans responded by mentioning that all testing labs/personnel are certified to perform AASHTO T30 and T308, and we should assume that they all are performing the tests according to the standards. Also, if the batching process would affect the results, it would have been observed over the years of running T30 and T308. Potential differences in testing procedures between different labs can be addressed through training. Adding a batching method to the current standards requires developing new CT test methods, which is lengthy and time consuming.
4. CT stated that they can provide a batching sheet as a recommendation, but we cannot enforce its use without developing a new test method.

Caltrans' response: Caltrans agreed to include batching sheet as part of the correction factor worksheets. Industry agreed to edit and supply the batch sheet form.

Dust Proportion

1. A concern was raised by David Ruedi regarding the ability to meet the dust to asphalt ratio. I know this question was discussed by Industry and Caltrans at one point. It was believed if the post plant gradation met the No. 200 sieve specifications the dust to asphalt ratio is should not be an issue.

Appendix J - Industry's Concerns and Recommendations for Future Work

From: Tony Limas <tlimas@calcima.org>
Sent: Tuesday, April 11, 2023 3:32 PM
To: Armanuse, Maged G@DOT; Foo, Kee Y@DOT
Cc: Denlay, Tim; vishal.jakkaraju@gcinc.com; ruedid@vmcmail.com; Don Vivant
Subject: PPG Final Report - Next Steps
Attachments: PPG Indutyr Review of Pilot Project Data.docx; PPG Street Ready Questions.docx

Follow Up Flag: Flag for follow up
Flag Status: Flagged

EXTERNAL EMAIL. Links/attachments may not be safe.

Maged,

Attached is the PPG pilot project data review information for the Final Report. Also attached is a list of Industry "Street Ready" questions that we need to answer before we pull the trigger to make sure we are not missing anything.

Below are the changes that industry would like to see as a condition of moving forward with post plant gradation (items 1-4). After some discussion between myself and Kee I listed the items and Kee verified his responses (blue text). It looks like at this point we have two buckets. One bucket has items that OAP is ok with (items 1-4). We need CT to provide industry with a final agreement on these items. Once we have a full agreement on these items, we need to include them in the PPG Final report and make sure they are applicable when we roll out the PPG specifications. Not sure how CT wants to proceed to complete this task, but we need to move quickly.

The 2nd bucket would be items that go into the PPG Final Report under "Industry's concerns and future improvements". Industry and Caltrans can work on these proposals outside of the PPG effort. If we can reach some agreements, we can get them into the 2024 Standards.

Possible changes: (Can't speak for all of CT, only as a rep from OAP)

Remove the 375F max aggregate temperature and the requirement. I'm OK with this proposal. I assumed that the superheated virgin aggregate will transfer heat to the RAP, and the virgin-RAP aggregate would have cool down significantly that it will not "burn/sizzle" the binder come in contact with them.

Remove requirement for cold feed RAP gradations. I'm OK with this proposal

Modify CT 384 to remove requirement to establish rock correction for use with RAP cold feed gradations. I'm OK with this proposal. I also want to stress that OAP is not the owner of CTMs, and that OAP will not implement related specification changes without the a complete package (ie., Modified CT 384 and Modified CEM 3512). Actually, OAP is required to make sure all related changes (ie CT 384 and CEM 3512) have been made before submitting specification changes to OCCS. Please note that METS is the owner of CTs and HQ Construction is the owner of CEMs.

Add footnote to DP indicating that it is based on post plant material. I'm OK with this proposal.

Industry's concerns and future improvements:

5. Eliminate metering requirements for the return of baghouse collected fine aggregates (BCFA) I support no change at this point in time.
Change LA Rattler from 40 to 45 max. I support no change at this point in time.
7. Remove requirement to fractionate RAP.
Remove RAP augmentation requirements.
9. Eliminate MPQP requirements related to skimmers, knock out box and cyclones.

PMPC Post Plant Gradation Industry Lead

DIRECTOR OF ASPHALT ADVOCACY & TECHNICAL AFFAIRS
California Construction and Industrial Materials Association

Office: (916) 554-1000

Wireless: (916) 712-5605



Barzegari, Saman@DOT

From: Armanuse, Maged G@DOT
Sent: Tuesday, May 23, 2023 1:56 PM
To: Tony Limas
Cc: Barzegari, Saman@DOT; Pourtahmasb, Saeed@DOT; Herbert, Jeff R@DOT; Rockenstein, Julia@DOT; Thangavelautham, Raguparan@DOT
Subject: RE: Peripheral Spec Changes Related to PPG - CT response
Attachments: CT Response to Industry's Comments_5-23-2023.docx
Importance: High

Tony

I attached Caltrans response to the industry's proposal

Please refer to the action items for each item as some of these items are addressed in the appendix of draft report that I sent earlier (expect the aggregate temperature change)

If no objection, I will revise the report and add aggregate temperature change to the final recommendation.

The attached document and this email will be added to the appendix as a back-up info.

Speaking on behalf of the CT's members of the WPG, we think we addressed all the industry's comments and if no objection I will send the revise report with the temperature change recommendation to the STG for final review

Please let me know if you have any feedback

Thanks

*Maged Armanuse, P.E.
(916) 284-6784
Branch Chief, Quality Assurance and Source Inspection
Materials Engineering and Testing Services (METS)
Division of Engineering Services*



From: Tony Limas <tlimas@calcima.org>
Sent: Monday, May 15, 2023 11:16 AM
To: Armanuse, Maged G@DOT <maged.g.armanuse@dot.ca.gov>
Subject: FW: Peripheral Spec Changes Related to PPG

EXTERNAL EMAIL. Links/attachments may not be safe.

Maged,



Here is the write up to address the concerns related to the proposed peripheral Section 39 changes.

Please let me know if you have any questions.

Thanks,
Tony

TONY LIMAS
PMPC Post Plant Gradation Industry Lead

DIRECTOR OF ASPHALT ADVOCACY & TECHNICAL AFFAIRS
California Construction and Industrial Materials Association
Office: (916) 554-1000
Wireless: (916) 712-5605



Changes related to the implementation of Post Plant Gradations.

Background

During the initial discussions surrounding the use of post plant gradations (PPG) Caltrans informed industry that moving to post plant gradation would eliminate the need for maximum aggregate temperature and cold feed gradations. Industry is asking that Caltrans follow through on their previous commitments.

Note: According to Tony, this topic was discussed during the Joe Peterson's era. PPG Working Group was not part of that discussion and does not recall any mention of this topic during the development of the milestones and nSSP.

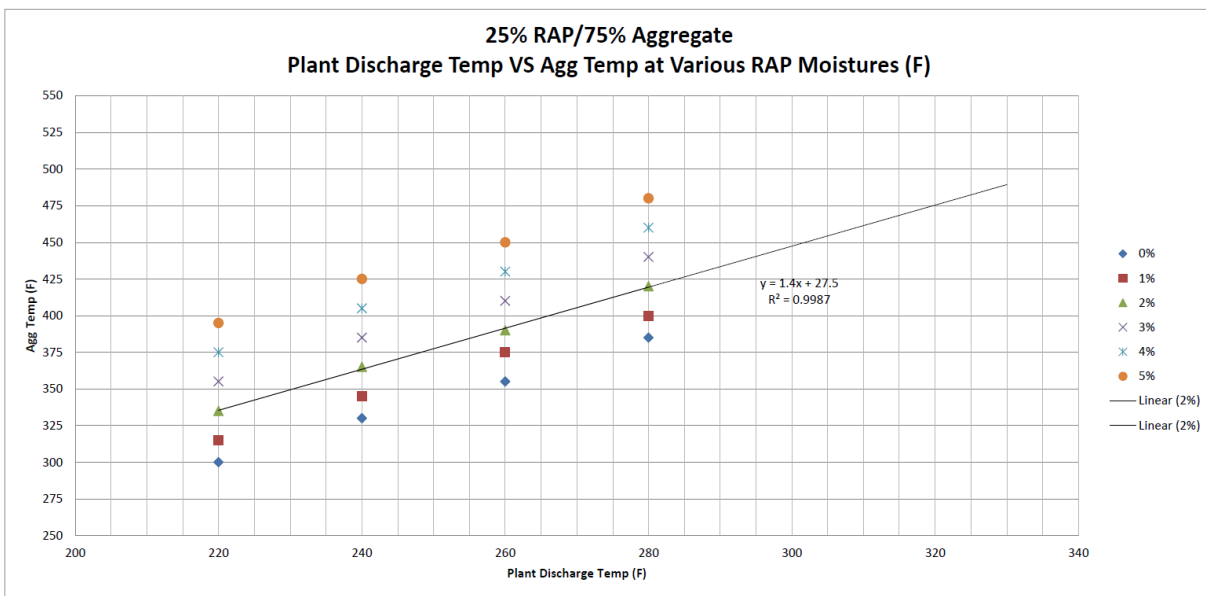
Caltrans PPG WPG members have a concern regarding how these changes would affect the post plant gradation pilot projects data if in place at the time when the PPG pilot project test sections were constructed. Industry has addressed these concerns below.

Note: The pilot projects utilize nSSP without the temperature change proposal.

Remove the 375°F max aggregate temperature requirement

Removing the 375°F max aggregate temperature requirement would be inconsequential in that the maximum temperature criteria, while specified, was not followed by the asphalt producers for the following reasons:

- Most HMA drum plants do not have a means to measure aggregate temperatures so in most cases there are no means to meet the specified requirement.
- More importantly, data provided by the National Asphalt Pavement Association (NAPA) indicates that:
 - For a mixture temperature of 325°F with 10% RAP containing 2% moisture, a virgin aggregate temperature of 390°F ± would be required to offset the temperature of the cold virgin aggregates and RAP.
 - For a mixture temperature of 325°F with 25% RAP containing 2% moisture, a virgin aggregate temperature of 480°F ± would be required to offset the temperature of the cold virgin aggregates and RAP.



There were five mixes containing RAP for PPG pilot projects. At least three mixes contained 24-25 percent RAP. Assuming the mix was produced at 325°F, the aggregate temperature for mixtures

containing 24-25 percent RAP was in the 480°F to 500°F range depending on the moisture content of the RAP at the time of HMA production.

Assuming a minimum of 10% RAP was used in mixes containing RAP, the mixtures containing RAP were produced with aggregate temperatures that exceeded the current 375°F maximum aggregate temperature criteria.

Thus, pilot project mix was produced without consideration of the 375°F maximum aggregate temperature restriction.

Caltrans' Response:

Caltrans agrees with eliminating the maximum aggregate temperature requirement but maintaining the maximum mix temperature as in the current specifications. While that issue was not included in the Milestones of this WPG, the proposed change will be included in the final recommendation for the Specification owner's consideration and implementation.

Action Item: This item will be added to the Final Recommendations (Page 5 of the report).

Remove the requirement to perform RAP cold feed gradations

The PPG pilot projects did not require RAP cold feed gradations other than 1 shadow test per day for information only (at Caltrans request). Caltrans request was focused on virgin aggregate plant breakdown. The request did not address RAP cold feed gradations.

The aggregate gradation specifications were based on post plant gradations in lieu of composite cold feed gradations. Thus, consideration for the use or non-use of cold feed gradations was at the discretion of the contractor. Removing the requirement to perform cold feed gradations (including RAP) is consistent with the production process (and specifications) used during production of HMA for the PPG pilot projects.

Caltrans' Response:

This has already been addressed in the proposed Specifications (Appendix F of the draft report). Requirement for determining and reporting cold feed RAP gradations has been eliminated.

Action Item: This item can be found in Appendix F of the draft report (Page 32 of the report).

Delete item 1 in the 4th paragraph of section 39-2.02A(4)(b)(iii)

During Type A HMA production, sample RAP twice daily and perform QC testing for:

- ~~1. Aggregate gradation at least once a day under California Test 384~~
2. Moisture content at least once a day

Revise CT 384 to remove requirement to establish aggregate gradation correlation factors

With the removal of the requirement to perform cold feed gradations, RAP aggregate correlation factors were not required for the PPG pilot projects. Consideration related to the use or non-use of RAP aggregate correlation factors were at the discretion of the contractor. This is consistent with the PPG Pilot Project nSSPs.

Caltrans' Response:

There is no need to revise CT 384 (combining gradations for HMA and RAP). Current Specifications determine the gradation of aggregates by mathematically combining the gradation of cold feed aggregates and RAP aggregates, determined as follows:

- Gradation of cold feed aggregates, determined through AASHTO T27 (sieve analysis of aggregates)
- Gradation of extracted RAP aggregates, determined following CT 384 (RAP aggregates are first extracted following AASHTO T 308, and gradation of extracted aggregates is determined following AASHTO T 30).

With the pilot project and proposed Specification (Appendices B and F of the draft report), reference to CT 384 has been removed from the footnote a of table in Section 39-2.02A(4)(b)(ii) of Standard Specs, and AASHTO T 27 was replaced with AASHTO T 30. The PPG gradation will be determined following AASHTO T 30 on aggregates extracted following AASHTO T 308 (modified).

Action Item: This item can be found in Appendix F of the draft report (Page 33 of the report).

Delete footnote a in the table in the 1st paragraph of section 39-2.02A(4)(e)

Add a footnote to DP indicating that it is based on post plant material

The footnote will not impact PPG pilot project outcomes. Contractors are aware of the requirement to use the post plant gradation when calculating the DP. The purpose of the footnote is to provide clarity and consistency for future technicians and engineers.

Caltrans' Response:

The DP is calculated based on percent passing sieve #200. After implementation of PPG Specifications, all HMA aggregate gradations (and DP, accordingly) will only be determined and reported from the PPG aggregates. Hence, no additional footnote is necessary.

Action Item: This item has been implicitly addressed by requiring aggregate gradation to be determined following AASHTO T 30 (from extracted aggregates) in Appendix F of the draft Report (Page 32-33 of the report).

Appendix K - Recommendations Regarding Voids in Mineral Aggregates (VMA) in Lab-produced HMA

Armanuse, Maged G@DOT

From: Tony Limas <tlimas@calcima.org>
Sent: Tuesday, July 25, 2023 8:55 AM
To: Armanuse, Maged G@DOT; Foo, Kee Y@DOT
Cc: Phil Reader; Pat Imhoff
Subject: RE: PPG Final report - Ready to be signed

EXTERNAL EMAIL. Links/attachments may not be safe.

Maged, Kee,
Industry is OK with leaving the specifications the way they currently are (no changes to VMA requirements).

Thank you,
Tony

TONY LIMAS
DIRECTOR ASPHALT ADVOCACY & TECHNICAL AFFAIRS
CALIFORNIA CONSTRUCTION AND INDUSTRIAL MATERIALS ASSOCIATION

Office: (916) 554-1000

Wireless: (916) 712-5605



www.calcima.org

<https://www.calcima.org/distancematters>

Follow CalCIMA on [Facebook](#)

Follow CalCIMA on [Twitter](#)

From: Armanuse, Maged G@DOT <maged.g.armanuse@dot.ca.gov>
Sent: Monday, July 24, 2023 1:23 PM
To: Tony Limas <tlimas@calcima.org>
Cc: Foo, Kee Y@DOT <kee.foo@dot.ca.gov>
Subject: RE: PPG Final report - Ready to be signed

Per my call with Tony, he will discuss with Industry and get back to us

Thanks

Maged Armanuse, P.E.
(916) 284-6784
Branch Chief, Quality Assurance and Source Inspection
Materials Engineering and Testing Services (METS)
Division of Engineering Services



From: Tony Limas <tlimas@calcima.org>
Sent: Monday, July 24, 2023 1:17 PM
To: Armanuse, Maged G@DOT <maged.g.armanuse@dot.ca.gov>
Cc: Foo, Kee Y@DOT <kee.foo@dot.ca.gov>
Subject: RE: PPG Final report - Ready to be signed

EXTERNAL EMAIL. Links/attachments may not be safe.

Good news,
I think this is the right decision.

Thanks,
Tony

TONY LIMAS
DIRECTOR ASPHALT ADVOCACY & TECHNICAL AFFAIRS
CALIFORNIA CONSTRUCTION AND INDUSTRIAL MATERIALS ASSOCIATION
Office: (916) 554-1000
Wireless: (916) 712-5605



www.calcima.org
<https://www.calcima.org/distancematters>
Follow CalcIMA on [Facebook](#)
Follow CalcIMA on [Twitter](#)

From: Armanuse, Maged G@DOT <maged.g.armanuse@dot.ca.gov>
Sent: Monday, July 24, 2023 11:16 AM
To: Tony Limas <tlimas@calcima.org>
Cc: Foo, Kee Y@DOT <kee.foo@dot.ca.gov>
Subject: FW: PPG Final report - Ready to be signed

Tony

See below from Kee foo

The proposal to have the VMA as a sperate issues and remove the Lab VMA requirement from the final report and address it through decision document process

Please provide the Industry's feedback on this change to the final report that we both signed

Thanks

Maged Armanuse, P.E.
(916) 284-6784
Branch Chief, Quality Assurance and Source Inspection
Materials Engineering and Testing Services (METS)
Division of Engineering Services





From: Foo, Kee Y@DOT

Sent: Monday, July 24, 2023 11:10 AM

To: Wong, Jacquelyn S@DOT <jacquelyn.wong@dot.ca.gov>; Armanuse, Maged G@DOT <maged.g.armanuse@dot.ca.gov>; Barros, Cathrina B@DOT <cathrina.barros@dot.ca.gov>

Cc: Dongo, Joseph K@DOT <joseph.dongo@dot.ca.gov>

Subject: RE: PPG Final report - Ready to be signed

Hi,

Per recommendation to deal with this apart from the working group, I would like to suggest removing the following (below) from the working group PPG report. Thanks.

Type A HMA Acceptance In Place

Quality characteristic	Test method
Asphalt binder content (%)	AASHTO T 308 Method A
HMA moisture content (max, %)	AASHTO T 329
Air voids content at <u>N_{design}</u> (%) ^{a, b}	AASHTO T 269
~~Voids in mineral aggregate on <u>laboratory-produced</u> HMA (min, %)^d~~ Gradation: No. 4 3/8-inch 1/2-inch 3/4-inch 1-inch — with NMAS = 1-inch — with NMAS = 3/4-inch	MS-2 Asphalt Mixture Volumetrics
Voids in mineral aggregate on <u>plant-produced</u> HMA (min, %) ^a Gradation: No. 4 3/8-inch 1/2-inch 3/4-inch 1-inch with NMAS = 1-inch with NMAS = 3/4-inch	MS-2 Asphalt Mixture <u>Volumetrics^c</u>
Dust proportion	MS-2 Asphalt Mixture Volumetrics
Density of core (% of max theoretical density) ^{e, f}	California Test



Page A-24 of A-102

Kee Foo
Sr. Transportation Engineer
Office of Asphalt Pavement
Pavement Program
Division of Maintenance
(916) 639-5898

From: Wong, Jacquelyn S@DOT <jacquelyn.wong@dot.ca.gov>

Sent: Wednesday, July 19, 2023 2:52 PM

To: Armanuse, Magda B@DOT <magda.armanuse@dot.ca.gov>; Barros, Cathrina B@DOT

8/1/2023

<cathrina.barros@dot.ca.gov>

Cc: Foo, Kee Y@DOT <kee.foo@dot.ca.gov>; Dongo, Joseph K@DOT <joseph.dongo@dot.ca.gov>

Subject: RE: PPG Final report - Ready to be signed

Thanks Maged,

We had 3+4 yesterday afternoon 1-230 in fact.

There was talk of potential dispute related to this coming forth. We had discussed and generally agreed on wrapping up the PPG report and excluding the VMA topic since it wasn't part of the SD.

With that said, can the VMA issue be handled separately through the ASTG (suitable for decision doc?). Dose this make sense and can this work?

Jacquelyn Wong, P.E.
Chief, Office of Central Laboratories
Materials Engineering and Testing Services
C: (916) 799-6227
Jacquelyn.Wong@dot.ca.gov

Are you satisfied with my service? Please share your thoughts here: [METS Customer Survey](#)



From: Armanuse, Maged G@DOT <maged.g.armanuse@dot.ca.gov>

Sent: Wednesday, July 19, 2023 2:44 PM

To: Wong, Jacquelyn S@DOT <jacquelyn.wong@dot.ca.gov>; Barros, Cathrina B@DOT <cathrina.barros@dot.ca.gov>

Cc: Foo, Kee Y@DOT <kee.foo@dot.ca.gov>

Subject: FW: PPG Final report - Ready to be signed

Jackie / Cathrina

See Tony's email below regarding the VMA & Kee Foo comments
The report is ready be signed by the industry
I expect this issue will come up during the ATG

Thanks

Maged Armanuse, P.E.
(916) 284-6784
Branch Chief, Quality Assurance and Source Inspection
Materials Engineering and Testing Services (METS)
Division of Engineering Services



From: Tomas Limas <tlimas@calcima.org>

Sent: Wednesday, July 19, 2023 2:41 PM
Page A-51 of A-106

8/1/2023

To: Armanuse, Maged G@DOT <maged.g.armanuse@dot.ca.gov>

Cc: Foo, Kee Y@DOT <kee.foo@dot.ca.gov>

Subject: RE: PPG Final report - Ready to be signed

EXTERNAL EMAIL. Links/attachments may not be safe.

Maged,

Industry position is to finish PPG report, issue specification and place VMA on bin list and prioritize. Adjustment to VMA is not part of SD.

Thanks

Tony

TONY LIMAS

PMPC Post Plant Gradation Industry Lead

DIRECTOR OF ASPHALT ADVOCACY & TECHNICAL AFFAIRS

California Construction and Industrial Materials Association

Office: (916) 554-1000

Wireless: (916) 712-5605



From: Armanuse, Maged G@DOT <maged.g.armanuse@dot.ca.gov>

Sent: Wednesday, July 19, 2023 9:15 AM

To: Tony Limas <tlimas@calcima.org>

Cc: Foo, Kee Y@DOT <kee.foo@dot.ca.gov>

Subject: FW: PPG Final report - Ready to be signed

Tony

Would you please provide the industry's feedback on Kee Foo email below?

Thanks

Maged Armanuse, P.E.

(916) 284-6784

Branch Chief, Quality Assurance and Source Inspection

Materials Engineering and Testing Services (METS)

Division of Engineering Services



From: Foo, Kee Y@DOT

Sent: Monday, July 17, 2023 12:17 PM

To: Tony Limas <tlimas@calcima.org>

Cc: Barros, Cathrina B@DOT <cathrina.barros@dot.ca.gov>; Armanuse, Maged G@DOT <maged.g.armanuse@dot.ca.gov>

Subject: PPG Final report - Ready to be signed



Hi Maged and Tony,

I'm not ready to sign the final report. I believed that the specs change to the VMA requirement should be as shown below.

~~Voids in mineral aggregate on laboratory-produced HMA (min, %)^d~~ ~~Gradation:~~ ~~No. 4~~ ~~3/8 inch~~ ~~1/2 inch~~ ~~3/4 inch~~ ~~1 inch~~ ~~— with NMAS = 1 inch~~ ~~— with NMAS = 3/4 inch~~	~~SP-2 Asphalt Mixture Volumetrics~~	(5.0 ± 1.5 for 1-inch aggregate) ~~16.5–19.5~~ ~~15.5–18.5~~ ~~14.5–17.5~~ ~~13.5–16.5~~ ~~13.5–16.5~~ ~~14.5–17.5~~
Voids in mineral aggregate on plant-produced HMA (min, %)^e Gradation: No. 4 3/8-inch 1/2-inch 3/4-inch 1-inch with NMAS = 1-inch with NMAS = 3/4-inch	SP-2 Asphalt Mixture Volumetrics^e	~~15.5–18.5~~ 16.0–19.0 ~~14.5–17.5~~ 15.0–18.0 ~~13.5–16.5~~ 14.0–17.0 ~~12.5–15.5~~ 13.0–16.0 ~~12.5–15.5~~ 13.0–16.0 ~~13.5–16.5~~ 14.0–17.0
Dust proportion	SP-2 Asphalt	

If ASTG can agree with this, we can make the changes and I'll signed the report with a special note to this change. Thanks.

Kee Foo
Sr. Transportation Engineer
Office of Asphalt Pavement
Pavement Program
Division of Maintenance
(916) 639-5898

From: Armanuse, Maged G@DOT <maged.g.armanuse@dot.ca.gov>
Sent: Monday, July 17, 2023 10:31 AM
To: Tony Limas <tlimas@calcima.org>
Cc: Foo, Kee Y@DOT <kee.foo@dot.ca.gov>; Thangavelautham, Raguparan@DOT <raguparan.thangavelautham@dot.ca.gov>; Pourtahmasb, Saeed@DOT <Saeed.Pourtahmasb@dot.ca.gov>; Herbert, Jeff R@DOT <jeff.herbert@dot.ca.gov>; Rockenstein, Julia@DOT <Julia.Rockenstein@dot.ca.gov>; Barzegari, Saman@DOT <Saman.Barzegari@dot.ca.gov>
Subject: FW: PPG Final report - Ready to be signed

Tony

Per previous discussion, I believe we addressed all the Industry's comments and I included Kee Foo VMA comment on the matrix resolution list to be elevated to the ATG (if needed)

At this point, the working group members concur that the working product is completed as stated in the scoping document.



Attached is the final PPG report, I already signed on Page 8, please provide your signature on the same page

Also, I attached the matrix resolution list addressing all the comments that I received

Once, I have your signature, I will forward the report to Kee foo to be signed by ATG

Thanks

Maged Armanuse, P.E.

(916) 284-6784

Branch Chief, Quality Assurance and Source Inspection

Materials Engineering and Testing Services (METS)

Division of Engineering Services



Appendix L – Post Plant Gradation Implementation Plans

L.1 – Independent Assurance (IA) Implementation Plan and Task Email

To ensure that the proposed changes in the acceptance criteria, new test methods (AASHTO T 308 and AASHTO T 30) and revised specification changes are consistently implemented statewide, the WPG has worked with the Independent Assurance (IA) Program to confirm that these changes are implemented through standardized IA written exams and practical exam checklists. According to IA, AASHTO T308 is already a part of JTCP, whereas AASHTO T 30 already has written and practical exams.

The IA Program will develop an implementation plan outlining responsibilities and outreach efforts to the district IA staff. To achieve this goal, IA will:

- 1) Develop IA written exams.
- 2) Develop IA Practical exam checklists.
- 3) Communicate necessary IA Program changes to IA Personnel
- 4) Communicate to impacted Laboratories and Testing Technicians through statewide outreach (Likely SIAD or through Materials Administrator

In addition, IA has the following main tasks:

- Outreach to labs and technicians regarding spec change
- IA personnel training on the T 30 tester certification process

From: Hibbard, Richard@DOT
Sent: Friday, February 19, 2021 2:47 PM
To: Armanuse, Maged G@DOT; Peterson-Self, Jeremy D@DOT
Cc: Rockenstein, Julia@DOT; Hoffman, Keith D@DOT
Subject: RE: PMPC / WG / Post Plant Aggregate Gradation / IA Task

Maged,

Sorry this has been a bit delayed. What the PMPC is proposing will require a substantial adjustment to IA and the JTCP, so I've been trying to wrap my brain around this.

1. Development of practical and written exams for these test methods.

These were completed several months ago, however they may need some minor tweaks, depending on the pilot project outcome. I think our practical exam focus on T 308 would definitely need some changes in consideration of sieve correction factors. This might take a few weeks of edits, review and trials. The T 30 practical is probably okay as is.

2. Certification of labs and materials testers in AASHTO T308 (modified) and AASHTO T30. It is anticipated that Caltrans field labs will be running the daily gradation acceptance testing in addition to District labs, contractor labs, etc.

This will take some time. Many labs and testers are T 308 certified, but pretty much zero are on T 30. We would need to perform substantial outreach to let labs know what is coming. Since this would definitely fall within JTCP, we would need to begin the process of T 30 certification outside of JTCP for currently JTCP certified testers. This would likely also require some level of testing in regard to the T 308 modifications. Before we start certifying and accrediting, we would need to get the IA's trained up on the expectations. I think once we get this show on the road, the IA service requests will start to pour in, but it will take awhile to get to everyone.

- T 308 (modified) & T 30 Lab outreach – 2 months
- IA training – 2 months, overlapping with outreach
- Lab accreditation & tester certification – minimum 6 months to substantial statewide compliance

3. Changes to Joint Training program curriculum to include these test methods.

Our JTCP training focus would need to be adjusted substantially. Since JTCP is a collaboration, we will need to get Advisory Council approval and then engage the Technical Committee on training strategies. The module layout would change, most likely for HMA II, which would pick up T 30 as an additional TM. Fortunately, I think HMA II has a bit of room to allow for the addition without adding days to the training session.

- JTCP Advisory Council special meeting review – 2 months
- JTCP Advisory Council technical committee training development – 1-2 months
- Modify JTCP handbooks, presentations, train instructors, equip labs, modify CSULB contract (if needed) – about 1 year to official kick-off, but overlapping the above items

Let me know if you need additional info.

Thanks,

Richard Hibbard, PE
Acting Branch Chief
IA North / Joint Training and Certification Program
Material Engineering and Testing Services



Are you satisfied with my service? Please share your thoughts here: [METS Customer Survey](#)



From: Armanuse, Maged G@DOT <maged.g.armanuse@dot.ca.gov>
Sent: Tuesday, February 9, 2021 9:24 AM
To: Peterson-Self, Jeremy D@DOT <jeremy.peterson-self@dot.ca.gov>; Hibbard, Richard@DOT <Richard.Hibbard@dot.ca.gov>
Cc: Rockenstein, Julia@DOT <Julia.Rockenstein@dot.ca.gov>; Hoffman, Keith D@DOT <keith.hoffman@dot.ca.gov>
Subject: RE: PMPC / WG / Post Plant Aggregate Gradation / IA Task

Jeremy

I agree with your statement to wait until we are done with Pilot Projects

We are in the process to draft the working group report to document our agreement with the Industry so far

What I am asking for is to have a one pager Implementation plan to highlight the items that need to be in place once we finalize the RSS (joint Training & IA) and the resources needed (rough idea is ok)

There are other issues will be added to the implementation plan from the District Lab side as well

Thanks

Maged Armanuse, P.E.
Senior Bridge Engineer
Branch Chief, Quality Assurance and Source Inspection – Dist. 4 & 5
Office of Structural Materials
Materials Engineering and Testing Services (METS)
Division of Engineering Services
(916) 284-6784

How are we doing?

Please take a moment to answer a few questions about our services at the following link: [METS Customer Survey](#)



From: Peterson-Self, Jeremy D@DOT
Sent: Tuesday, February 9, 2021 9:19 AM



To: Armanuse, Maged G@DOT <maged.g.armanuse@dot.ca.gov>; Hibbard, Richard@DOT <Richard.Hibbard@dot.ca.gov>

Cc: Rockenstein, Julia@DOT <Julia.Rockenstein@dot.ca.gov>; Hoffman, Keith D@DOT <keith.hoffman@dot.ca.gov>

Subject: RE: PMPC / WG / Post Plant Aggregate Gradation / IA Task

Maged/Richard,

Just want to clarify Item C. below.

Modifications to the JTCP Program requires JTCP Advisory Council approval (not to mention a significant effort in updating the manuals that is not currently resourced).

Recommend if these changes are currently for a Pilot Project, we wait until full implementation before adding to JTCP.

Let me know if you have questions.

Thanks,

Jeremy Peterson-Self, PE
Office Chief
Materials Management and Independent Assurance
Materials Engineering and Testing Services
O: (916) 227-7232 | C: (916) 261-4910
E: Jeremy.Peterson-Self@dot.ca.gov

Are you satisfied with my service? Please share your thoughts here: [METS Customer Survey](#)



From: Armanuse, Maged G@DOT <maged.g.armanuse@dot.ca.gov>

Sent: Monday, February 8, 2021 1:45 PM

To: Hibbard, Richard@DOT <Richard.Hibbard@dot.ca.gov>

Cc: Rockenstein, Julia@DOT <Julia.Rockenstein@dot.ca.gov>; Peterson-Self, Jeremy D@DOT <jeremy.peterson-self@dot.ca.gov>; Hoffman, Keith D@DOT <keith.hoffman@dot.ca.gov>

Subject: RE: PMPC / WG / Post Plant Aggregate Gradation / IA Task

Richard

Bullets points & time frame as well as any resources needed

I attached the implementation plan that I prepared for the HWT a while ago for your reference

Thanks

Maged Armanuse, P.E.
Senior Bridge Engineer
Branch Chief, Quality Assurance and Source Inspection – Dist. 4 & 5



Office of Structural Materials
Materials Engineering and Testing Services (METS)
Division of Engineering Services
(916) 284-6784

How are we doing?

Please take a moment to answer a few questions about our services at the following link: [METS Customer Survey](#)



From: Hibbard, Richard@DOT
Sent: Monday, February 8, 2021 1:37 PM
To: Armanuse, Maged G@DOT <maged.g.armanuse@dot.ca.gov>
Cc: Rockenstein, Julia@DOT <Julia.Rockenstein@dot.ca.gov>; Peterson-Self, Jeremy D@DOT <jeremy.peterson-self@dot.ca.gov>; Hoffman, Keith D@DOT <keith.hoffman@dot.ca.gov>
Subject: RE: PMPC / WG / Post Plant Aggregate Gradation / IA Task

Maged,

We will take a look at this and get something back to you this week. Do you need a bullet-point list of items with time frames? Some other format?

Thanks,
Richard

From: Armanuse, Maged G@DOT <maged.g.armanuse@dot.ca.gov>
Sent: Thursday, February 4, 2021 11:06 AM
To: Hibbard, Richard@DOT <Richard.Hibbard@dot.ca.gov>
Cc: Rockenstein, Julia@DOT <Julia.Rockenstein@dot.ca.gov>; Peterson-Self, Jeremy D@DOT <jeremy.peterson-self@dot.ca.gov>; Hoffman, Keith D@DOT <keith.hoffman@dot.ca.gov>
Subject: FW: PMPC / WG / Post Plant Aggregate Gradation / IA Task

Richard

We are in the process to prepare a draft report for this effort, part of this report to include "Implementation Plan"

I would like to get a response from IA as far as what need to be done to implement this change with a rough estimate of the time frame

Please include any info about resources needed as well

I appreciate getting this info by end of February

Thanks

Maged Armanuse, P.E.



Senior Bridge Engineer
Branch Chief, Quality Assurance and Source Inspection – Dist. 4 &5
Office of Structural Materials
Materials Engineering and Testing Services (METS)
Division of Engineering Services
(916) 284-6784

How are we doing?

Please take a moment to answer a few questions about our services at the following link: [METS Customer Survey](#)



From: Armanuse, Maged G@DOT
Sent: Monday, February 1, 2021 3:12 PM
To: Hibbard, Richard@DOT <Richard.Hibbard@dot.ca.gov>
Cc: Peterson-Self, Jeremy D@DOT <jeremy.peterson-self@dot.ca.gov>; Wong, Jacquelyn S@DOT (<jacquelyn.wong@dot.ca.gov> <jacquelyn.wong@dot.ca.gov>; Hoffman, Keith D@DOT <keith.hoffman@dot.ca.gov>; <guadalupe.magana@dot.ca.gov>; Rockenstein, Julia@DOT <Julia.Rockenstein@dot.ca.gov>; Wu, Rommoney@DOT <Rommoney.Wu@dot.ca.gov>; DeLong, Eric J@DOT <eric.delong@dot.ca.gov>; Hartz, Sarah A@DOT <sarah.hartz@dot.ca.gov>; Lo, Patrick@DOT <patrick.lo@dot.ca.gov>
Subject: PMPC / WG / Post Plant Aggregate Gradation / IA Task

Richard

Per my discussion with Jeremy, please see below as far as the IA involvement in the Post Plant Gradation efforts

The Post Plant Aggregate Gradation in HMA Working Group has developed a nSSP to move to using AASHTO T 308 (modified) and AASHTO T 30 for QC and Acceptance testing of aggregate gradations for HMA in pilot projects planned for this next construction season, see the attached summary of changes.

The modification to AASHTO T 308 is to change Section A2.9.2 from applying correction factors to specific sieves according to Table A2.1 to applying correction factors to all sieves for acceptance gradation test results. Deleting Table A2.1.

For AASHTO T 30, the practical and written exams will stress the mechanical washing, if used, will run ONLY until water runs clear or 10 minutes maximum. Testers are expected to NOT set timer for 10 minutes and walk away. We don't want additional breakdown of aggregates caused by mechanical washing.

For the pilot projects we are specifying the AASHTO test methods with the modifications. If this change is implemented after the pilot projects, we will develop at California Test Methods referencing the AASHTO Test Methods with the required modifications.

We have identified the following needs for implementation of these test methods. The first two items will be needed for the pilot projects.

1. Development of practical and written exams for these test methods.
2. Certification of labs and materials testers in AASHTO T308 (modified) and AASHTO T30. It is anticipated that Caltrans field labs will be running the daily gradation acceptance testing in addition to District labs, contractor labs, etc.
3. Changes to Joint Training program curriculum to include these test methods.



Your feedback will be part of the implantation plan for the Post Plant Gradation Working Product.

Please let me know if you have any questions

Thanks

*Maged Armanuse, P.E.
Senior Bridge Engineer
Branch Chief, Quality Assurance and Source Inspection – Dist. 4 &5
Office of Structural Materials
Materials Engineering and Testing Services (METS)
Division of Engineering Services
(916) 284-6784*

How are we doing?

Please take a moment to answer a few questions about our services at the following link: [METS Customer Survey](#)



L.2 - Caltrans Labs and Implementation Workplan

The PPG WPG conducted a survey of the Caltrans Field and District Labs to evaluate the availability of equipment and trained personnel, and to document the equipment that is required to purchase to implement PPG. The following questionnaire was distributed among the laboratories, and their responses was recorded as part of the implementation plan.

Questionnaires:

Below are the survey questions for the Post Plant Aggregate Gradation Acceptance Testing Implementation Plan that we discussed at the last DME Meeting. Please respond by xx/xx/2022 so we may include your responses in the implementation plan.

- Testers and labs need to be IA certified in AASHTO T-308 and AASHTO T-30
 - Equipment:
 - Ignition oven and associated basket assemblies
 - Mechanical sieve shaker & associated sieves
 - Wash vessel
 - Oven
1. Are the field acceptance testing labs under Construction in your District?
If yes, please skip field lab questions (4 and 5) below.

District Labs:

2. Does the lab or technician(s) lack any certifications in AASHTO T-308 or AASHTO T-30? Please list.
3. Does your lab have the required equipment listed above?
 - a. If no: What equipment do you need?
Please list equipment and power and or venting needs if applicable.

Field Labs:

4. Does the lab or technicians lack any certifications in AASHTO T-308 or AASHTO T-30?
5. Does your lab have the required equipment listed above?
 - a. If no: What equipment do you need?
Please list equipment including power, venting or other installation needs, if applicable.
 - a. Is the field lab a state-owned facility or a leased facility?

Please contact yyy if you have any questions.

The PMPC Asphalt Task Group is working on moving to Post Plant Aggregate Gradation Acceptance Testing. There are 13 pilot projects in construction this season.

We are working on an implementation plan (not for pilot projects) to ensure the labs and testers are ready when the new specification is rolled out statewide. You have been identified as Construction Seniors and Lab Managers for field acceptance testing labs.

Below are survey questions for the Post Plant Aggregate Gradation Acceptance Testing Implementation Plan. Please respond by xx/xx/2022 so we may include your responses in the implementation plan.

New specification requirements:

- Testers and labs need to be IA certified in AASHTO T-308 and AASHTO T-30
- Equipment:
 - Ignition oven and associated basket assemblies
 - Mechanical sieve shaker & associated sieves
 - Wash vessel
 - Oven

Field Labs:

1. Does the lab or technicians lack any certifications in AASHTO T-308 or AASHTO T-30?
2. Does your lab have the required equipment listed above?
 - b. If no: What equipment do you need?
Please list equipment including power, venting or other installation needs, if applicable.
 - a. Is the field lab a state-owned facility or a leased facility?

Please contact yyy if you have any questions.

Lab Location	Field/District Lab	Lab & technician certification in test methods	Do you have the required equipment	What equipment is needed?	Additional needs for equipment installation	Leased or State-owned facility
D1	District	?	Yes			State
Arcata	Field					Leased
Clear Lake	Field					Leased
Clear Lake	Field					Leased
Crescent City	Field	Need T 30	Yes			Leased
Ft. Bragg	Field					Leased
Fortuna	Mobile					Leased
Redwood Valley	Field					Leased
Redwood Valley	Field					Leased
Willow Creek	Mobile					State
D2	District	Need T-30	Yes			State
Burney	Field	Need T-30	Yes			State
Burney	Field	Need T-30	Yes			State
Mt. Shasta	Field	Need T-30	Yes			State
Red Bluff	Field	Need T-30	Yes			State
Redding	Field	Need T-30	Yes			Leased
Susanville	Field	Need T-30	Yes			State
Yreka	Field	Need T-30	Yes			Leased
D3	District	Yes	Yes			State
Rocklin	Field	No - In process	Yes			Leased
Chico	Field	Need T-30	Yes			Leased
D4	District					Leased
Concord	Field					Leased
Hayward	Field					Leased
Petaluma	Field					Leased
Pleasanton	Field					Leased
Richmond	Field	Need T-30	Yes			State
San Jose	Field					State
San Mateo	Field					Leased
Vallejo	Field					Leased
D5	District	Yes	Yes			State

Lab Location	Field/District Lab	Lab & technician certification in test methods	Do you have the required equipment	What equipment is needed?	Additional needs for equipment installation	Leased or State-owned facility
Paso Robles	Field	No	No	<i>ignition oven with internal balance</i> <i>Specimen Blanket Assembly (X2)</i> <i>(Consisting of specimen basket(s), catch pan, and an assembly guard to secure the specimen basket(s) to the catch pan. Screen mesh or other suitable material with maximum and minimum openings of 2.36 mm (No. 8) and 0.600 mm (No. 30).</i> <i>Safety glasses or face shield, high-temperature gloves, long-sleeved</i>	<i>ignition oven installation/venting (venting "...shall have no noticeable odors escaping into the lab.") upgrade existing electrical system in lab. Already near max capacity. a physical location to put the ignition oven. There is currently no space with existing layout/equipment.</i>	Leased

Lab Location	Field/District Lab	Lab & technician certification in test methods	Do you have the required equipment	What equipment is needed?	Additional needs for equipment installation	Leased or State-owned facility
				<i>jacket, a heat-resistant surface capable of withstanding 650°C (1202°F), and a protective cage capable of surrounding the specimen baskets during the cooling period, a pan larger than the specimen basket(s) for transferring the specimen after ignition, spatulas, bowls, and wire brushes.</i>		

Lab Location	Field/District Lab	Lab & technician certification in test methods	Do you have the required equipment	What equipment is needed?	Additional needs for equipment installation	Leased or State-owned facility
King City	Field	No		<i>ignition oven with internal balance</i> <i>Specimen Blanket Assembly (X2)</i> <i>(Consisting of specimen basket(s), catch pan, and an assembly guard to secure the specimen basket(s) to the catch pan. Screen mesh or other suitable material with maximum and minimum openings of 2.36 mm (No. 8) and 0.600 mm (No. 30).</i> <i>Safety glasses or face shield, high-temperature gloves, long-</i>	<i>ignition oven installation/venting (venting "...shall have no noticeable odors escaping into the lab.") upgrade existing electrical system in lab. Already near max capacity. a physical location to put the ignition oven. There is currently no space with existing layout/equipment.</i>	State

Lab Location	Field/District Lab	Lab & technician certification in test methods	Do you have the required equipment	What equipment is needed?	Additional needs for equipment installation	Leased or State-owned facility
				<i>sleeved jacket, a heat-resistant surface capable of withstanding 650°C (1202°F), and a protective cage capable of surrounding the specimen baskets during the cooling period, a pan larger than the specimen basket(s) for transferring the specimen after ignition, spatulas, bowls, and wire brushes.</i>		

Lab Location	Field/District Lab	Lab & technician certification in test methods	Do you have the required equipment	What equipment is needed?	Additional needs for equipment installation	Leased or State-owned facility
Whitney Gardens	Field	Need T-30	No	The lab needs an ignition oven (and basket assemblies). Additionally, the lab needs long oven gloves and basket tongs.	Appropriate venting installed	Trailer is leased.
Buellton	Field					
Carpinteria	Field					
Prunedale	Field					State
Santa Barbara	Field					
Santa Cruz	Field					State
Santa Maria	Field					
San Luis Obispo	Field					
D6	District	Yes	Yes			State
Fresno	Field					
Visalia	Field					
Bakersfield	Field					
D7	District					
Encino	Field					
Encino	Field					
Encino	Field					
Irwindale	Field					State
Littlerock	Field					State
Long Beach	Field					Leased
Long Beach	Field					Leased
Moor Park	Field					State
Santa Fe Springs	Field					
Saticoy	Field					State
Sun Valley	Field					State
Valencia	Field					Leased
Wittier	Field					
D8	District					

Lab Location	Field/District Lab	Lab & technician certification in test methods	Do you have the required equipment	What equipment is needed?	Additional needs for equipment installation	Leased or State-owned facility
Hesperia	Field					
Barstow	Field					
Fontana	Field					
D9	District	Yes	Yes			State
SRL (D7, D8, D12)						
D10	District					State
Merced	Field					State
Modesto	Field					State
Stockton	Field					Leased
Sonora	Field					State
Ione	Field					State
D11	District					
Spring Valley	Field					State
San Diego	Field					
Carmel Valley	Field					
Encinitas (Cardiff)	Field					State
El Centro	Field					State
D12	District	Need T-30	Yes			State

L.3 - DIME Implementation Plan

To facilitate implementation of the new PPG Specifications, the WPG coordinated with DIME team to make sure the required test methods are available in DIME and are operational. Below is the summary of steps that will be taken to ensure the PPG Specifications are ready for use in DIME.

- The addition of a new test card in DIME: "AASHTO T308-10: Standard Method of Test for Determining the Asphalt Binder Content of Hot Mix Asphalt (HMA) by the Ignition Method (Annex, Correction Factors)." This test card will follow the asphalt binder and aggregate correction factor procedure as specified in the annex of the test method standard, and it will be applicable for mixes with or without RAP.
- DIME's "AASHTO T30-19: Standard Method of Test for Mechanical Analysis of Extracted Aggregate (Mechanical Analysis)" test card will be modified to accept an aggregate correction for aggregates obtained from AASHTO T 308.
- DIME's "AASHTO T308-10: Standard Method of Test for Determining the Asphalt Binder Content of Hot Mix Asphalt (HMA) by the Ignition Method (Asphalt Binder Content)" test card will be slightly modified.

L.4 – Proposed CPD

If needed, the Division of Construction will decide to issue a CPD when the Post Plant Gradation specification becomes a standard specification.

L.5 - Construction Manual Update

Construction manual needs to be updated to reflect the changes in the Specifications, and to ensure Construction personnel are familiar with the new procedures. To accommodate these changes, The following section of the construction Manual will be updated:

- Section 4-39: Asphalt Concrete
- Section 6-102C: Acceptance Samples and Tests (Table 6-1.2. Time Required for Materials Acceptance Tests)
- Section 6-107: Materials Acceptance Sampling and Testing (Table 6-1.13. Materials Acceptance Sampling and Testing Requirements:
Asphalt Concrete (***Standard Specifications*** Section 39)

L.6 – Industry Implementation Plan

No implementation plan has been received from the industry for inclusion in this report.

Appendix M – Outreach Records

M.1 - Fact sheets

Post production Gradation Acceptance for Hot Mix Asphalt Request for Pilot Project Selection

Purpose

As part of the Department's Strategic Priorities of Innovation and Partnering, the Pavement Materials Partnering Committee (PMPC) seeks to improve the mix design and HMA acceptance specification by replacing the pre-plant aggregate gradation with post production aggregate gradation.

Issue

Aggregate gradation before hot mix asphalt (HMA) production (pre-plant gradation) is different from aggregate gradation after HMA production (post production gradation) due to aggregate breakdown during the HMA plant production process. The degree of aggregate breakdown is related to the thermal and mechanical stresses exerted on the aggregate during HMA production as well as the aggregate's resistance to breakdown. Specifications of plant produced HMA materials should be based on post production aggregate gradation because:

- HMA volumetric is based on post production materials
- Post production gradation is the closest gradation to the final product
- Post production gradation is more representative than mathematically combined gradation of RAP and virgin aggregates

Pilot Projects

The PMPC work product group has selected AASHTO T 308 and AASHTO T 30 as the preferred test methods and developed a nSSP for pilot projects. To evaluate the nSSP and test methods for future implementation, a variety of projects from each of the State regions is needed for pilot projects. The work product group will gather data from these pilot projects to identify and correct possible issues before implementation as a standard.

Pilot Projects Criteria

- Have projects in all California regions— coastal, northern, southern, and central,
- Non-Statistical Pay Factor (SPF) projects,
- About 10,000 tons HMA,
- Some with lime-treated aggregates,
- Some with rubberized mixes.

Risks

The risks for pilot projects are low. The selected test methods will not require any additional lab equipment for the pilot projects. AASHTO T 308 is currently used in Job Mix Formula (JMF) verification and binder content acceptance testing. AASHTO T 30 uses the same equipment as AASHTO T 27 currently used for virgin aggregate gradation testing. Any potential increase in costs to projects should be minimal since nearly all suppliers are already using this process, unofficially. There should be no significant increased cost per ton to the State on bid prices. No impact to project schedule is expected. Selected projects would be advertised with the nSSP. A team consisting of METS, Pavement Program and HQ Construction will be available during project construction for assistance.

M.2 – FHWA

From: Foo, Kee Y@DOT
Sent: Friday, November 5, 2021 1:19 PM
To: Armanuse, Maged G@DOT; Wei, Chu (FHWA); Dvorak, Dennis (FHWA); Nener-Plante, Derek (FHWA)
Cc: Rockenstein, Julia@DOT; Pourtahmasb, Saeed@DOT
Subject: RE: Post Plant Gradation - PMPC working group

Hi,

Thank you all for the meeting which is very informative and helpful. I would like to summarize my takeaway from this meeting.

1. Going to post plant gradation is a good effort.
2. Post plant gradation can be determine using:-
 - a. Solvent Extraction
 - b. Ignition Oven
 - i. Most state does not do aggregate correction factors because the corrections are “small” and distributed over all the sieve sizes. Most states did study or have data to support that aggregate correction factors are not needed. In addition, ignition oven correction factors cannot be determine without knowing the actual post plant gradation prior to ignition oven test.
 - ii. Caltrans nSSP determine preplant gradation from bin/bin percentages or belt cut for a project. Caltrans then perform ignition oven on a plant produced HMA from that particular project. Finally, Caltrans determine aggregate correction factors as the difference between uncorrected ignition aggregate gradation and preplant gradation.
 - iii. I’m supposed to ask this question at the meeting but I forgot (sorry). Does FHWA recommend not having correction factors (item 2.b.i) or having correction factors as Caltrans determine them in (item 2.b.ii)?
3. Future Caltrans specifications will remove all pre-plant gradation requirements and replace them with post plant gradation requirements
4. Implementation of post plant gradation will eliminate the following pre-plant specification items identified in the scoping document.
 - a. Eliminate all aggregate production temperature restriction placed in the specs to minimized aggregate breakdown
 - b. Eliminate the allowance to add up to 1.5% passing #200 materials (pixie dust) to account for aggregate breakdown during mix design
 - c. Eliminate the current Lab-Produced HMA’s WMA requirement and Plant-Produced’s VMA requirement. Replace them with only Plant-Produced’s VMA requirement. See below.

Type A HMA Acceptance In Place

Quality characteristic	Test method	Requirement
Asphalt binder content (%)	AASHTO T 308 Method A	JMF -0.30, +0.50
HMA moisture content (max, %)	AASHTO T 329	1.00
Air voids content at N_{design} (%) ^{a, b}	AASHTO T 269	4.0 ± 1.5 (5.0 ± 1.5 for 1-inch aggregate)
<u>Voids in mineral aggregate on laboratory-produced HMA (min, %)^d</u> Gradation: No. 4 3/8-inch 1/2-inch 3/4-inch 1-inch — with NMAS = 1-inch — with NMAS = 3/4-inch	<u>MS-2 Asphalt Mixture Volumetrics</u>	 16.5–19.5 15.5–18.5 14.5–17.5 13.5–16.5 13.5–16.5 14.5–17.5
Voids in mineral aggregate on <u>plant-produced</u> HMA (min, %) ^a Gradation: No. 4 3/8-inch 1/2-inch 3/4-inch 1-inch with NMAS = 1-inch with NMAS = 3/4-inch	MS-2 Asphalt Mixture <u>Volumetrics^c</u>	 15.5–18.5 14.5–17.5 13.5–16.5 12.5–15.5 12.5–15.5 13.5–16.5
Dust proportion	MS-2 Asphalt Mixture Volumetrics	0.6–1.3 ^g
Density of core (% of max theoretical density) ^{e, f}	California Test	91–93

Please let me know if I have misunderstood anything. I assume that we will set up a meeting for FHWA will give the larger group their opinions and recommendations. Thanks.

Kee Foo
Sr. Transportation Engineer
Office of Asphalt Pavement
Pavement Program
Division of Maintenance
(916) 639-5898

From: Armanuse, Maged G@DOT <maged.g.armanuse@dot.ca.gov>
Sent: Friday, November 5, 2021 11:53 AM
To: Wei, Chu (FHWA) <chu.wei@dot.gov>; Dvorak, Dennis (FHWA) <Dennis.Dvorak@dot.gov>; Nener-Plante, Derek (FHWA) <derek.nenerplante@dot.gov>
Cc: Rockenstein, Julia@DOT <Julia.Rockenstein@dot.ca.gov>; Pourtahmasb, Saeed@DOT <Saeed.Pourtahmasb@dot.ca.gov>; Foo, Kee Y@DOT <kee.foo@dot.ca.gov>
Subject: RE: Post Plant Gradation - PMPC working group

Chu / Dennis / Derek

I would like to thank you for your participation & feedback during our meeting today

I attached a short presentation, fact sheet, pilot projects procedure and NSSP for your reference.



In the coming months the working group will collect and evaluate the pilot projects data.

I will reach out to FHWA for feedback once the working group draft the final report after the pilot projects phase completed.

Again, the PPG working group appreciate your comments & feedback and please let me know if you need any additional info

Thanks

*Maged Armanuse, P.E.
Senior Bridge Engineer
Branch Chief, Quality Assurance and Source Inspection – Dist. 4 &5
Materials Engineering and Testing Services (METS)
Division of Engineering Services
(916) 284-6784*

How are we doing?

Please take a moment to answer a few questions about our services at the following link: [METS Customer Survey](#)



-----Original Appointment-----

From: Wei, Chu (FHWA) <chu.wei@dot.gov>

Sent: Tuesday, November 2, 2021 12:52 PM

To: Wei, Chu (FHWA); Armanuse, Maged G@DOT; Dvorak, Dennis (FHWA); Foo, Kee Y@DOT; Nener-Plante, Derek (FHWA)

Subject: Post Plant Gradation

When: Friday, November 5, 2021 11:00 AM-12:00 PM (UTC-08:00) Pacific Time (US & Canada).

Where: Microsoft Teams Meeting

EXTERNAL EMAIL. Links/attachments may not be safe.

-----Original Appointment-----

From: Wei, Chu (FHWA) <chu.wei@dot.gov>

Sent: Friday, October 15, 2021 10:41 AM

To: Wei, Chu (FHWA); Dvorak, Dennis (FHWA); Foo, Kee Y@DOT; Nener-Plante, Derek (FHWA)

Subject: Post Plant Gradation

When: Friday, November 5, 2021 11:00 AM-12:00 PM (UTC-08:00) Pacific Time (US & Canada).

Where: Microsoft Teams Meeting

EXTERNAL EMAIL. Links/attachments may not be safe.

Hi all,



Please see below email and we will discuss the questions on post plant gradation.

Thanks,

Chu

Hi Dennis and Chu,

We, Caltrans folks, have a discussion on our Post Plant Gradation (PPG) effort and would like to get your opinions on how to best achieved our stated objectives. The objective (and background information) is stated in the attached Post Plant Gradation scoping document.

This is my understanding of the group's plan to achieve the objective stated in the scoping document.

CURRENT JMF REQUIREMENT ON GRADATION

1. Current Gradation Specification (for $\frac{3}{4}$ " HMA-Type A as an example)
2. Determine gradation from hot bin or cold feed
3. If used, determine RAP gradation (Currently requirement is for Contractor to run a one-time three replicate extractions test on RAP at mix design)
4. Mathematically combine bin or cold feed gradation with RAP gradation according to prescribed percentages to get Combined Gradation
5. Checked Combined Gradation with Gradation Specification (Step 1) for specification compliance

Determine Aggregate Correction Factor (per PPG)

6. Secure JMF HMA samples ("hotdrop" or at plant)
7. Determine aggregate correction factors per AASHTO T 308 (Aggregate correction factors are difference between ignition oven burned gradation established during calibration and Combined Gradation in Step 5.)

Determine Aggregate Gradation at Production (per PPG)

8. Secure production HMA samples (most likely at plant or behind the paver)
9. Determine aggregate gradation by running AASHTO T30 after AASHTO T 308 and applying aggregate correction factor obtained from Step 7

Questions:

1. Does aggregate gradation (from Step 9) more closely represent "pre-plant aggregate gradation" or "post-plant aggregate gradation"?
2. Does the above steps uses post plant materials (HMA) to determine "pre-plant aggregate gradation"?
3. Does the above steps uses post plant materials (HMA) to determine "post-plant aggregate gradation"?
4. Any suggestions or improvement to the above steps to achieve the objective of the scoping document?

Thank you for your views/opinions on this matter.

Microsoft Teams meeting

Join on your computer or mobile app

[Click here to join the meeting](#)

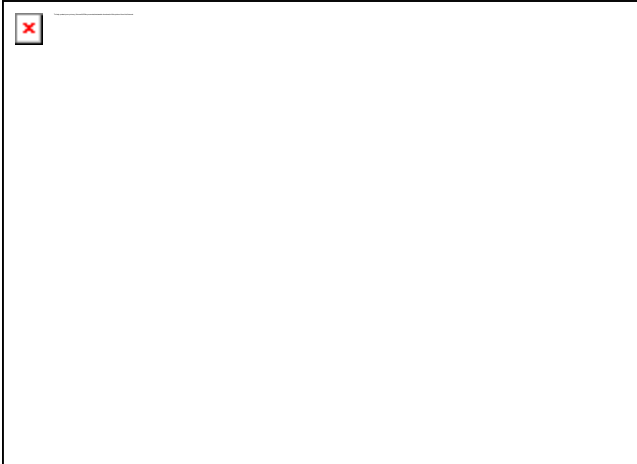
Or call in (Caltrans only)



[+1 213-204-6178,,499109917#](#) United States, Los Angeles

Phone Conference ID: 499 109 917#

[Find a local number](#) | [Reset PIN](#)



The United States Department of Transportation

[Learn More](#) | [Help](#) | [Meeting options](#)

M.3 - DMEs

Post-Plant Aggregate Gradation in Hot-Mix Asphalt

Pavement Materials Partnering Committee (PMPC)
Working Product Group

August 26, 2021

Agenda

- ▶ Welcome and introduction
- ▶ Overview of Pavement and Materials Partnering Committee
- ▶ Overview of the Post Plant Gradation Scoping Document
- ▶ Overview of the NSSP, test methods and proposed forms
- ▶ Ongoing and upcoming pilot projects status
- ▶ Pilot project procedures
- ▶ Round table and questions
- ▶ Closing

Pavement & Materials Partnering Committee Background & History

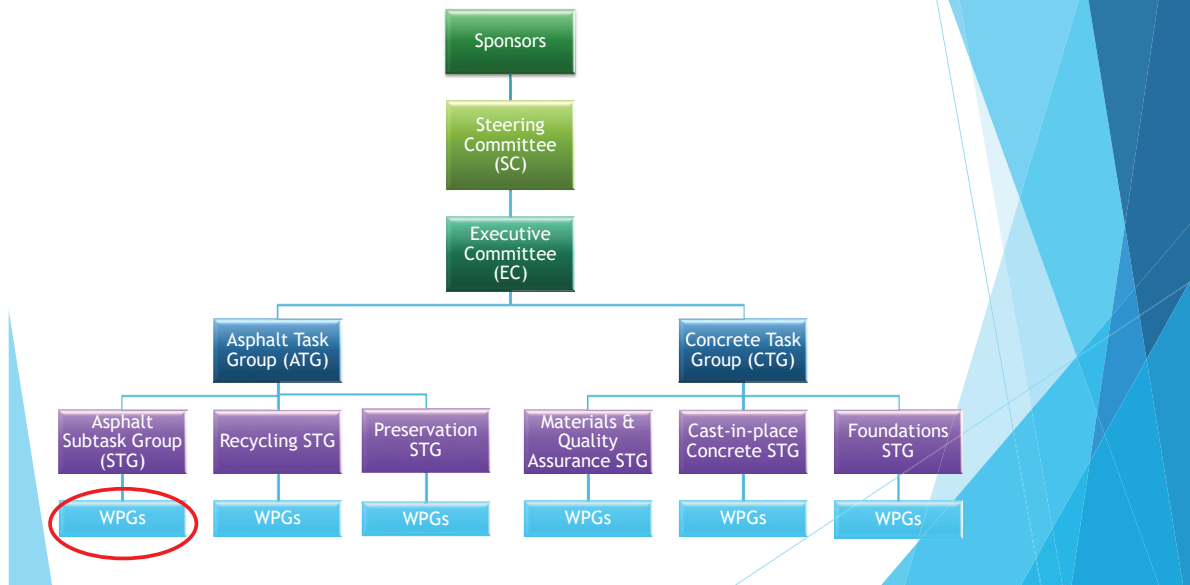
- ▶ Pavement & Materials Partnering Committee (PMPC) Charter signed 2018 (formerly Rock Products Committee (RPC))
- ▶ Purpose:
 - ▶ Provide a forum for Caltrans to coordinate efforts with Industry to review and propose improvements to construction standards
- ▶ <https://dot.ca.gov/programs/maintenance/pavement/pavement-materials-partnering-committee>

The image shows a document titled "Pavement & Materials Partnering Committee (PMPC) Charter". It contains three sections of approvals, each with a signature and a date:

- Executive Committee Approvals:**
 - MARK S. CHANES, Acting State Pavement Engineer, Division of Maintenance, dated 2/15/18.
 - DANIEL H. SPIER, State Materials Engineer, Division of Engineering Services, dated 2/15/18.
 - THOMAS A. COLEMAN, State Bridge Engineer, Division of Engineering Services, dated 2/15/18.
 - THOMAS A. PYLE, Assistant Chief, Division of Construction, dated 2/15/18.
 - RUSSELL W. SYSTER, CMC, Executive Director, California Asphalt Pavement Association, dated 2/15/18.
 - CHARLEY BEA, Director of Communications & Policy, California Construction and Industrial Materials Association, dated 2/15/18.
- Steering Committee Approvals:**
 - JOHN J. BOONKA, Chief, Division of Maintenance, dated 2/15/18.
 - MICHAEL D. KEEVER, Chief, Division of Engineering Services, dated 2/15/18.
 - RACHEL FALABETTI, Chief, Division of Construction, dated 2/15/18.
- Sponsor Approvals:**
 - STEVE JACKSON, dated 2/15/18.
 - STEVE JACKSON, dated 2/15/18.

At the bottom, it says "Nov. 2018" and "Page 6 of 6".

PMPC Organization



Post Plant Gradation Working Product Group

Maged Armanuse, QASI/METS - Bay Area, Caltrans (Lead)

Tony Limas, Granite Construction, Industry member, (Lead)

Saeed Pourtahmasb, Pavement, Caltrans

Raguparan Thangavelautham, Construction, Caltrans

Jeff Herbert, Dist.3 Lab Manager, Caltrans

Julia Rockenstein, QASI/METS Sacramento, Caltrans

David Ruedi, Vulcan Materials, Industry

Dan Vivant, Sully-Miller Contracting, Industry

Tim Denlay, Knife River Corporation, Industry

Scoping Document (signed by Executive Committee)

Purpose

- ▶ This PMPC WPG aims to improve mix design and HMA acceptance specifications by replacing pre-plant aggregate gradation with post-plant gradation (PPG)
- ▶ Current attempts to minimize and/or account for aggregate breakdown in pre-plant aggregate gradation are then no longer required. Producer must account for material breakdown.
- ▶ Now that mixes are accepted based on volumetrics of plant produced material, moving to post plant gradation is the logical step in acceptance testing.

Background

- ▶ Pre-plant gradation was specified in the design and acceptance of plant-produced Hveem mixes; acceptance was not based on HMA volumetric.
- ▶ In 2014, full HMA volumetric requirements were adopted with the implemented of Superpave mix design.
- ▶ Note: Mix design requirements have not changed.

Scoping Document cont.

Approach

- ▶ Street ready assurance
- ▶ Performance tracking/management
- ▶ Consistently implemented
- ▶ Pilot projects
- ▶ Research needs

Milestones

- ▶ Conduct literature review of relevant research, FAA practices, and other DOT practices ✓
- ▶ Identify a test method to measure PPG ✓
- ▶ Develop nSSP ✓
- ▶ Implement on pilot projects and gather data - in process
- ▶ Analyze PPG vs. pre-plant
- ▶ Modify specification requirements (if needed)
- ▶ Finalize & Submit RSS to OCCS

Progress as of August 2021

Literature Review

- ▶ Caltrans currently has no PPG in specifications
- ▶ 2014 FHWA survey reported 17 states perform PPG
- ▶ Majority of states perform PPG for acceptance
- ▶ Some use for both acceptance and specific pay factor
- ▶ 39 states use some form of PPG
- ▶ Generally, state specifications reference AASHTO T 30 as test method used
- ▶ Caltrans requires AASHTO T 30 for mechanical analysis of the RAP aggregate in the current specification. The WPG proposes to use AASHTO T 30 for aggregate gradation acceptance for the HMA mix. Caltrans also currently uses AASHTO T 308 for determining the asphalt binder content of HMA mixes.

Progress as of April 2021

Test Method Modifications

- ▶ Caltrans/Industry reached consensus to use a modified version of AASHTO T 308, along with referenced AASHTO T 30
- ▶ Modified FHWA forms 1640 and 1648 for Caltrans use
- ▶ Some of the following changes include, but are not limited to:
 - ▶ Applying correction factors to all sieves
 - ▶ Swapping #40 sieve with #100 to align with current practice

- ▶ Plan to revisit test method modifications

Progress continued

nSSP

- ▶ Caltrans/Industry went over Section 39 and highlighted areas to subject to modification
- ▶ A specification change tracking document has been created to identify and track proposed changes
- ▶ nSSP is finalized and sent to specification owner and OE - completed.

nSSP for Pilot Projects

Replace *AASHTO T 308* at each occurrence in section 39 with:
AASHTO T 308 (Modified)

Add to the table in the 5th paragraph of section 39-2.01A(1):

<i>AASHTO T 30</i>	2019
--------------------	------

Add between the 2nd and 3rd paragraphs of section 39-2.01A(4)(a):
AASHTO T 308 (Modified) is *AASHTO T 308*, except section A2.8.2 is modified as follows:

Determine the average difference for the two values. The aggregate correction factors (equal to the resultant average differences) for all sieves shall be applied to all acceptance gradation test results determined by *T 30*, prior to final rounding and reporting.

Replace the 1st paragraph of section 39-2.01B(4)(b) with:
Test for aggregate gradation under *AASHTO T 30*.

Add to the table in the 1st paragraph of section 39-2.02A(4)(b)(ii):

Gradation	<i>AASHTO T 27</i>	Once per day – Report only
-----------	--------------------	----------------------------

Replace *AASHTO T 27* in the row for *Gradation* in the table in the 1st paragraph of section 39-2.02A(4)(b)(iii) with:

AASHTO T 30

Delete footnote *a* in the table in the 1st paragraph of section 39-2.02A(4)(b)(ii).

Replace *AASHTO T 27* in the row for *Aggregate gradation* in the table in item 1 in the paragraph of section 39-2.02A(4)(e) with:

AASHTO T 30

Delete footnote *a* for the table in item 1 in the paragraph of section 39-2.02A(4)(e)

Replace *AASHTO T 27* in the row for *Gradation* in the table in the 1st paragraph of section 39-2.03A(4)(c)(iii) with:

AASHTO T 30

Replace *AASHTO T 27* in the row for *Aggregate gradation* in the table in item 1 in the list in the paragraph of section 39-2.03A(4)(e)(i) with:

AASHTO T 30

Replace *AASHTO T 27* in the row for *Aggregate gradation* in the table in item 1 in the list in the paragraph of section 39-2.04A(4)(c)(i) with:

AASHTO T 30

Determination of Correction Factors for Aggregate Gradation Testing

- ▶ During Job Mix Formula (JMF) verification, the post plant gradation correction factors need to be established from the binder correction factor material.
- ▶ The grading correction factors must be determined for each ignition oven used for post plant gradation testing.
- ▶ Both the contractor and Caltrans will determine aggregate correction factors for each JMF.
- ▶ Acceptance testing: Field or District Lab for pilot projects.
Implementation plan will address future acceptance testing i.e., equipment needs.

Determination of Correction Factors for Aggregate Gradation Testing - cont.

- ▶ AASHTO T-308 (modified per the project specifications) and AASHTO T-30 shall be used for determination of the correction factors and the aggregate gradations for each individual sieve. How you treat RAP currently is how you will treat the plant produced mix **except** you will use the corrections established during the JMF verification and not the contractor supplied correction factors.
- ▶ Testing frequency shall be per project specifications. For CALTRANS Acceptance Testing: Cold feed samples will not be needed except for running SE or other aggregate quality tests. A little more work at JMF verification time to establish correction factors but should reduce the workload during acceptance testing. Use supplied forms for correction factors determination.
- ▶ Batch and correct back to the "as received sample" gradation. For acceptance testing, determine the binder content per AASHTO T 308, then wash and grade the aggregates per AASHTO T 30, applying said correction factors. Report results.

Worksheet for HMA Correction factor reporting Page 1

FWA form adopted for PMPC
Post Plant Gradation Working Group

**WORKSHEET FOR IGNITION FURNACE BINDER CORRECTION FACTOR
AASHTO T 308**

Source: _____ HMA Type: _____ Date: _____
 Sample ID: _____ Tested by: _____
 Target binder content, % by mass of Mix: _____ % by mass of Agg: _____ Test temperature, (°C): _____
 Ignition Furnace Manufacturer: _____ Serial #: _____ Location of Furnace: _____

	Trial No. 1	Trial No. 2
(A) Initial "buttered" bowl mass, g		
(B) Final bowl mass ¹ , g		
(C) Bowl mass difference, (B - A), g		
(D) Dry aggregate mass, g		
(E) Aggregate & binder mass, g		
(F) Binder mass, (E - D), g		
(G) Corrected binder mass, (F - C), g		
(H) Actual binder content by mixture mass, (G / (D + G)) * 100, %		
(I) Sample basket assembly mass, g		
(J) Sample basket assembly & mix mass ² , g		
(K) Mix mass ³ , (J - I), g		
(L) Ignition furnace binder content, % by mass of mix		
(M) Correction factor, (L - H), %	L1	L2
(N) Average correction factor ⁴ , ((L1 + L2) / 2), %	Average	
(O) Difference in correction factor ⁵ , (L1 - L2), %	Difference	0.00

¹ Scrape the bowl until the final mass is within ± 0.5 grams of the initial "buttered" mass.
² After placing the basket assembly and mix into the ignition furnace verify that the displayed mass and the mass recorded in (J) agree within ± 0.5 grams.
³ Be certain to meter (K), the mix mass into the ignition furnace control panel prior to initiating the burn cycle.
⁴ If the correction factor exceeds 1.0%, lower the test temperature to 482 °C and repeat the test. Use the correction factor at 482 °C when it exceeds 1.0%.
⁵ If the difference is greater than ± 0.15 percent, run two more samples and discard the high and low test results.

Remarks:

Worksheet for HMA Correction factor reporting Page 2

FWA form adopted for PMPC
Post Plant Gradation Working Group

**WORKSHEET FOR IGNITION FURNACE BINDER CORRECTION FACTOR
AASHTO T 308**

Source: _____ HMA Type: _____ Date: _____
 Sample ID: _____ Tested by: _____
 Target binder content, % by mass of Mix: _____ % by mass of Agg: _____ Test temperature, (°C): _____
 Ignition Furnace Manufacturer: _____ Serial #: _____ Location of Furnace: _____

Aggregate Gradation Correction Factor (% Passing)

Sieve Size	Trial #1	Trial #2	"Blank"	Trial #1 Difference	Trial #2 Difference	Average Difference	Allowable Difference
1" / 25mm							±5.0
3/4" / 19 mm							±5.0
1/2" / 12.5 mm							±5.0
3/8" / 9.5 mm							±5.0
#4 / 4.75 mm							±5.0
#6 / 2.36 mm							±5.0
#50 / 600 µm							±3.0
#100 / 300 µm							±3.0
#150 / 150 µm							±3.0
#200 / 75 µm							±0.5

Handwash: ☐ Mechanical Wash: ☐ Time: _____

Remarks:

Worksheet for HMA with RAP Correction factor reporting Page 1

FDWA form adopted for PHPC
Pavement Gradation Working Group

**WORKSHEET FOR IGNITION FURNACE BINDER CORRECTION FACTOR AND
AGGREGATE GRADATION CORRECTION FACTOR FOR MIXES INCLUDING RAP**

Source: _____ Date: _____
 Sample ID: _____ Tested by: _____ Test Temp. (°C): _____
 Target binder content, % by mass of Mix: _____ Binder content, RAP, % by mass of RAP: _____
 Ignition Furnace Manufacturer: _____ Serial #: _____ Location of Furnace: _____

	Trial No. 1	Trial No. 2
(A) Initial "buttered" bowl mass, g		
(B) Final bowl mass, g		
(C) Bowl mass difference, (B - A), g		
(D) Mass of RAP, g		
(E) Mass of RAP Aggregate, g (D * (RAP/100))		
(F) Mass of RAP Binder, g (D * (RAP/100))		
(G) Dry Virgin Aggregate mass, g		
(H) Virgin Binder mass, g		
(I) Total Binder mass, (F + H), g		
(J) Corrected binder mass, (I - C), g		
(K) Actual binder content by mixture mass, I / (D + G + H) * 100, %		
(L) Sample basket assembly mass, g		
(M) Sample basket assembly & mix mass, g		
(N) Mix mass, (M - L), g		
(O) Ignition furnace binder content by mass of mix, %		
(P) Correction factor, (O - K), %	P1	P2
(Q) Average correction factor, ((P1 + P2) / 2), %	Average	
(R) Difference in correction factor, (P1 - P2), %	Difference	

Group the bowl and the steel mass to within 0.1 g. Round the mass "buttered" mass.
 For purposes of determining required virgin asphalt content use the PLD Addendum to AASHTO T 300: Correction Factors for Hot Mix Asphalt
 (PLD) Containing Revised Asphalt Properties (RAP) Example 1-4.
 After placing the bowl assembly and mix into the ignition furnace verify that the displayed mass and the mass recorded in (N) agree within ± 1
 gram.
 Be certain to enter (N), the mix mass into the ignition furnace control panel prior to starting the burn cycle.
 If the correction factor is not ± 1.0%, lower the test temperature to 402 °C and repeat the test. Use the correction factor at 402 °C even if it results
 in 1.0%.
 If the difference is greater than ± 0.15 percent, run two more samples and discard the high and low test results.

Remarks: _____

Page 1 of 2

Worksheet for HMA with RAP Correction factor reporting Page 2

FDWA form adopted for PHPC
Pavement Gradation Working Group

**WORKSHEET FOR IGNITION FURNACE BINDER CORRECTION FACTOR AND
AGGREGATE GRADATION CORRECTION FACTOR FOR MIXES INCLUDING RAP**

Source: _____ Date: _____
 Sample ID: _____ Tested by: _____ Test Temp. (°C): _____
 Target binder content, % by mass of Mix: _____ Binder content, RAP, % by mass of RAP: _____
 Ignition Furnace Manufacturer: _____ Serial #: _____ Location of Furnace: _____

Mix Composition, % mass of Mix: Virgin Agg: _____ RAP: _____
 Mix Composition, % mass of Agg: Virgin Agg: _____ RAP Agg: _____
☐ English ☐ Metric

Aggregate Gradation Correction Factor (AASHTO T 30, Sieve Analysis, % Passing)

Sieve Size	Trial #1	Trial #2	Virgin Agg Gradation "blank"	Bound RAP Agg Gradation "blank"	Calculated "blank"	Trial #1 Difference	Trial #2 Difference	Average Difference	Allowable Difference
1" / 25mm									±5.0
3/4" / 19 mm									±5.0
1/2" / 12.5 mm									±5.0
3/8" / 9.5 mm									±5.0
#4 / 4.75 mm									±5.0
#10 / 2.0 mm									±5.0
#20 / 850 µm									±3.0
#40 / 425 µm									±3.0
#60 / 300 µm									±3.0
#100 / 150 µm									±3.0
#200 / 75 µm									±0.5

Handwash: ☐ Mechanical Wash: ☐ Time: _____

Remarks: _____

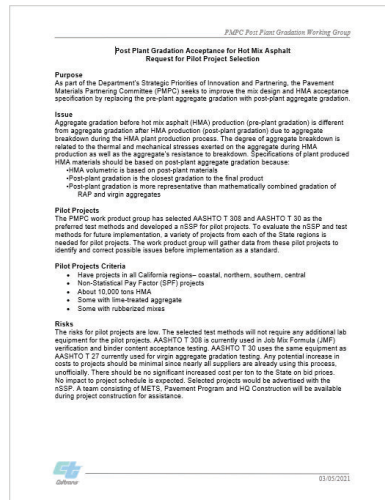
Page 2 of 2

Pilot Project Selection Criteria (HQ Construction)

- ▶ Criteria:
 - ▶ Have projects in all California regions- coastal, northern, southern, central
 - ▶ Non-SPF projects
 - ▶ Minimum 10,000 tons
 - ▶ Gather a list of 30, before final selection
 - ▶ Some with lime-treated aggregate
 - ▶ Some with rubberized mixes
- ▶ Coordination of pilot project selections with Districts and DMEs is ongoing
- ▶ Advertise projects with nSSP and/or add to existing contracts via CCO.

Pilot Projects

- ▶ Developed Fact Sheet
- ▶ Developed CCO
- ▶ Developed CCO Memo



Pilot Projects - Confirmed

- ▶ 02-1J4704 - Data received
- ▶ 02-1J4604 - Data Received
- ▶ 05-1M0104 - In construction, data coming in
- ▶ 02-2J3904 - 2022 Season Advertise with nSSP
- ▶ 02-2J4104 - 2022 Season Advertise with nSSP
- ▶ 10-1N0704 - 2022 Season Advertise with nSSP

Pilot Project Data

Next steps after pilot project completion

- ▶ Compile data from pilot projects
- ▶ Analyze data from pilot projects
- ▶ Modify SSP if needed
- ▶ Test methods and forms need to be added to DIME - TBD
- ▶ IA certification/Joint Training for new test methods for non-AMRL labs - TBD
- ▶ Publish long term report on Post Plant Gradation
- ▶ Create Caltrans Test Methods referencing AASHTO T30 and AASHTO T 308 modifications

Need help or have questions? Contact

- ▶ Julia Rockenstein Julia.Rockenstein@dot.ca.gov (858) 302-7651
- ▶ Jeff Herbert Jeff.Herbert@dot.ca.gov (530) 741-4238
- ▶ Raguparan Thangavelautham raguparan.thangavelautham@dot.ca.gov (916) 764-8496
- ▶ Maged Armanuse maged.g.armanuse@dot.ca.gov (916) 284-6784

Questions ?

M.4 - Lab Managers for District and Field Labs

Post plant Aggregate Gradation in Hot-Mix Asphalt

Pavement Materials Partnering Committee (PMPC)

Working Product Group

August 26, 2021

Presenters: Maged Armanuse, Julia Rockenstein, Raguparan Thangavelautham, Jeff Herbert

List of Participants:

Caltrans Division	Representatives	Contact Information
District 1	Andre Guimaraes	andre.guimaraes@dot.ca.gov
	Leif Ayres	Leif.Ayres@dot.ca.gov
District 2	Ward Jenkins	ward.jenkins@dot.ca.gov
	Brian Steiner	brian.steiner@dot.ca.gov
District 3	Melaku Zeleke	melaku.zeleke@dot.ca.gov
	Jeff Herbert	jeff.herbert@dot.ca.gov
District 4	Venu Gopal	venu.gopal@dot.ca.gov
District 6	Raafat Shehata	raafat.shehata@dot.ca.gov
	Bryan Ash	bryan.ash@dot.ca.gov
	Harjaspreet Dhaliwal	jessa.dhaliwal@dot.ca.gov
District 7, 8 and 12	Godson Anyanwu	godson.anyanwu@dot.ca.gov
	Ghazi Roumani /SRL	ghazi.roumani@dot.ca.gov
	Prakash Gowda	prakash.gowda@dot.ca.gov
	Roger Khoudessian/SRL	roger.khoudessian@dot.ca.gov
	Cristina Paredes D/S & SRL	cristina.paredes@dot.ca.gov
District 9	Christopher Talbot	chris.talbot@dot.ca.gov
	Derek Carrington	derek.carrington@dot.ca.gov
District 10	Mandeep Dhesi	mandeep.dhesi@dot.ca.gov
District 11	David M. Cortez	dave.m.cortez@dot.ca.gov
	Melchor Oronoz	Melchor.Oronoz@dot.ca.gov
METS	Akira Hasegawa	Akira.Hasegawa@dot.ca.gov
	Maged Armanuse	maged.g.armanuse@dot.ca.gov
	Julia Rockenstein	Julia.Rockenstein@dot.ca.gov
	Saman Barzegari	Saman.barzegari@dot.ca.gov
	Guadalupe Magana	guadalupe.magana@dot.ca.gov
Construction	Raguparan Thangavelautham	raguparan.thangavelautham@dot.ca.gov
Division of Pavement	Saeed Pourtahmasb	Saeed.Pourtahmasb@dot.ca.gov

Agenda

- Overview of Pavement and Materials Partnering Committee
- Overview of the Post Plant Gradation Scoping Document
- Overview of the NSSP, test methods and proposed forms
- Ongoing and upcoming pilot projects status
- Pilot project procedures
- Round table and questions

Summary of the Discussion Points

Meeting Started at 2:32 PM.

A brief background about the Pavement & Materials Partnering Committee (formerly Rock Products Committee, RPC) was presented. The purpose of the committee, which was to provide a forum for Caltrans to coordinate efforts with Industry to review and propose improvements to construction standards was introduced. Organization chart of the PMPC was presented. Members of the Post Gradation Working Product Group (WPG) was presented:

- Maged Armanuse, QASI/METS - Bay Area, Caltrans (Lead)
- Tony Limas, Granite Construction, Industry member, (Lead)
- Saeed Pourtahmasb, Pavement, Caltrans
- Raguparan Thangavelautham, Construction, Caltrans
- Jeff Herbert, Dist.3 Lab Manager, Caltrans
- Julia Rockenstein, QASI/METS Sacramento, Caltrans
- David Ruedi, Vulcan Materials, Industry
- Dan Vivant, Sully-Miller Contracting, Industry
- Tim Denlay, Knife River Corporation, Industry

It was stated that the Post Plant Aggregate Gradation (PPG) WPG was started as a joint venture between Caltrans and Industry to develop requirements for implementing PPG in Caltrans projects in the future. The goal is to improve mix design and HMA acceptance specifications by replacing pre-plant aggregate gradation with PPG, which will help with accounting for aggregate breakdown during plant operations. WPG meetings started end of last year. The WPG was trying to establish “Street-ready” procedure for implementing PPG, by thoroughly testing the proposed method and addressing any potential issues. A set of milestones were defined, of which several has been completed.

- ☒ Conduct literature review of relevant research, FAA practices, and other DOT practices
Review of literature showed that currently 63% states (39 states) use PPG, which was a significant increase over the 17 states reported by FHWA in 2014.
- ☒ Identify a test method to measure PPG
Literature review showed that most states are either using AASHTO T 30 or a modified version of it for PPG. Caltrans already uses AASHTO T30 for RAP aggregates and uses AASHTO T 308 for determining asphalt binder of HMA mixes. Caltrans/Industry reached

consensus to use a modified version of AASHTO T 308, along with referenced AASHTO T 30. FHWA forms 1640 and 1648 were modified for CT use. The modified test methods will be revisited after pilot projects data are collected and reviewed.

- ☒ Develop nSSP
Section 39 of Standard Specs was reviewed and highlighted by Caltrans and Industry. The finalized nSSP is sent to Spec Owner and OE.
- ☐ Implement on pilot projects and gather data
- ☐ Analyze PPG vs. pre-plant
- ☐ Modify specification requirements (if needed)
- ☐ Finalize & Submit RSS to OCCS

The method for determining Correction Factors for aggregate gradation testing was discussed. It was mentioned that this change is going to be beneficial to the state, as the gradation will not be on a mathematical basis anymore (which is subject to constant changes and tweaks at the plants), but will be performed on the actual end product.

It was stated that majority of what is needed for use of PPG is already being done. The material after burn for asphalt correction factor determination will be removed, washed and graded to get the correction factor. Changes required compared with the current approach was discussed. It was mentioned that labs may need 12" sieves and shaker. Modified FHWA forms were displayed. It was mentioned that WPG may be required to remove the "Allowable Difference" column on Page 2 of the forms to prevent any confusion. WPG asked the attendees to report back any other issues or problems to be reviewed and addressed.

The criteria for selecting pilot projects were discussed. WPG wanted to test the nSSP before it is officially included in the Standard Specs. It was mentioned that the state of California has been divided into four Regions (coastal, northern, southern and central), and efforts were made to include projects from each region in the pilot project list. DMEs from each region has been contacted to volunteer few projects for this purpose. One important criterion was that the project would have finished within one construction season. The projects that are currently in design stage are to be advertised with the nSSP as part of the contract package. Ongoing/Awarded projects were to receive a Contract Change Order (CCO) to use PPG instead of pre-plant gradation. PWG is planning to have 15 pilot projects across the state, which would include lime-treated aggregates and rubberized asphalt as well. Currently, the following projects are ongoing as part of the pilot project program:

- 02-1J4704 - Data received
- 02-1J4604 - Data Received
- 05-1M0104 - In construction, data coming in
- 02-2J3904 - 2022 Season Advertise with nSSP
- 02-2J4104 - 2022 Season Advertise with nSSP
- 10-1N0704 - 2022 Season Advertise with nSSP

Discussions with districts for inclusion of other projects to the pilot program is ongoing. The attendees were asked if they are interested in volunteering projects in their districts for the pilot project program.

The future steps in the process were also discussed. After getting the data at the end of pilot projects, the data will be compiled and analyzed. nSSP will be updated if needed and will be proposed for acceptance as SSP. The CT Test method with reference to AASHTO will also be finalized and will be added to DIME. Training requirements for Independent Assurance and for non-AMRL labs will be decided. The long-term report on Post-Plant Gradation will be published. As mentioned before, WPG is looking forward to a smooth transition from pre-plant gradation to post-plant gradation, so it welcomes any feedback from lab managers.

Questions and Answers:

Andre Guimares (D1): Asked about the potential project in D1. WPG responded that an ongoing project was considered initially, but the contractor was not willing to accommodate the changes required, so it was dropped from the list. Two projects are in preliminary design steps in D1. It was further elaborated that the pilot projects were initially supposed to be all nSSP (in design stage) for next construction season, but as there was still time for starting work this year, the CCO idea was proposed. If the contractor is not willing, PWG cannot force it and cause delays. All projects next year will have it as nSSP, so volunteering is not required.

Godson Anyanwu (D7,8 and 12): Asked if the full implementation of PPG is planned for the next Construction Season (CS). PWG responded that after next CS no more pilot projects is required. The full and official implementation will be after all the data are collected and analyzed, the proposed method is finalized, and nSSP is turned into SSP. Before submitting the SSP for final approval, the draft will be circulated to districts to review and provide feedback. Godson also asked if PWG has reached out to the southern districts for the pilot projects, as they don't have any on the list at the moment, and they want to have some exposure before final implementation. Also asked about pilot project selection criteria. PWG responded that the 10,000 tons in HMA is not a very solid number, and more important is to be able to finish the project in one CS. For Southern districts, D9 will have one project for next year. PWG has reached out to all districts but not all districts were shown interest in cooperating in this venture. PWG has no preference for the projects to be in certain geographic location (North over south). Saeed said he was in touch with Parvaz (D8) and with Nader (D7) on behalf of PWG but haven't heard from D8. Godson said he will email contact them for further information. Maged mentioned the issue of lack of interest in participating in pilot projects is not limited to this PWG, so there is an effort by the Deputy from higher levels, so hopefully the issue will be alleviated.

Leif Ayres (D1): Asked about the minimum sample mass required for PPG, and if differences in the mass may affect gradation. Jeff responded that it was discussed internally, and it was decided to follow AASHTO T 30 requirements to use the entire post-burn sample for gradation. However, if results from the pilot projects show that this can be an issue, PWG may end up suggesting doing more than one burn per sample (which we already have to do often), and combine the results.

Mandeep Dhesi (D10): Mentioned that we may need some equipment. He mentioned that they have done some PPG in the past. He also said that district labs must be well equipped, but field laboratories will need additional equipment (such as ovens, 12" sieves and sieve shakers) for the new approach. Maged said the PWG doesn't handle equipment directly. Ragu said that most likely METS will reach

out to all districts to make sure they have the required equipment before finalizing the SSP, as part of the implementation plan.

Derek Carrington (D9): Asked about Data collection timeline for the pilot projects. Ragu mentioned that the data collection and submission deadlines are already established in the project timeline. PWG is hoping to gather all the data from current projects by this October. However, if the data are not received by the required deadline, the project might have to be dropped from the study. Maged mentioned that considering the number of projects and delays, it is likely the PWG may have to request for an extension for data collection and analysis.

Meeting was adjourned at 2:33 pm.

Post Plant Gradation Acceptance for Hot Mix Asphalt Request for Pilot Project Selection

Purpose

As part of the Department's Strategic Priorities of Innovation and Partnering, the Pavement Materials Partnering Committee (PMPC) seeks to improve the mix design and HMA acceptance specification by replacing the pre-plant aggregate gradation with post-plant aggregate gradation.

Issue

Aggregate gradation before hot mix asphalt (HMA) production (pre-plant gradation) is different from aggregate gradation after HMA production (post-plant gradation) due to aggregate breakdown during the HMA plant production process. The degree of aggregate breakdown is related to the thermal and mechanical stresses exerted on the aggregate during HMA production as well as the aggregate's resistance to breakdown. Specifications of plant produced HMA materials should be based on post-plant aggregate gradation because:

- HMA volumetric is based on post-plant materials
- Post-plant gradation is the closest gradation to the final product
- Post-plant gradation is more representative than mathematically combined gradation of RAP and virgin aggregates

Pilot Projects

The PMPC work product group has selected AASHTO T 308 and AASHTO T 30 as the preferred test methods and developed a nSSP for pilot projects. To evaluate the nSSP and test methods for future implementation, a variety of projects from each of the State regions is needed for pilot projects. The work product group will gather data from these pilot projects to identify and correct possible issues before implementation as a standard.

Pilot Projects Criteria

- Have projects in all California regions— coastal, northern, southern, central
- Non-Statistical Pay Factor (SPF) projects
- About 10,000 tons HMA
- Some with lime-treated aggregate
- Some with rubberized mixes

Risks

The risks for pilot projects are low. The selected test methods will not require any additional lab equipment for the pilot projects. AASHTO T 308 is currently used in Job Mix Formula (JMF) verification and binder content acceptance testing. AASHTO T 30 uses the same equipment as AASHTO T 27 currently used for virgin aggregate gradation testing. Any potential increase in costs to projects should be minimal since nearly all suppliers are already using this process, unofficially. There should be no significant increased cost per ton to the State on bid prices. No impact to project schedule is expected. Selected projects would be advertised with the nSSP. A team consisting of METS, Pavement Program and HQ Construction will be available during project construction for assistance.

Post Plant Gradation Pilot Project Testing

1. Testing technicians shall need to contact Caltrans Independent Assurance for test proficiency certification in AASHTO T-308 (modified) and AASHTO T-30 unless the lab is AMRL accredited.
2. During Job Mix Formula (JMF) verification, the post plant gradation correction factors need to be established from the binder correction factor material. The grading correction factors must be determined for each ignition oven used for post plant gradation testing. Both the contractor and Caltrans will determine aggregate correction factors for each JMF.
3. AASHTO T-308 (modified per the project specifications) and AASHTO T-30 shall be used for determination of the correction factors and the aggregate gradations for each individual sieve. How you treat RAP currently is how you will treat the plant produced mix except you will use the corrections established during the JMF verification and not the contractor supplied correction factors. Testing frequency shall be per project specifications. For CALTRANS Acceptance Testing: Cold feed samples will not be needed except for running SE or other aggregate quality tests. A little more work at JMF verification time to establish correction factors but should reduce the workload during acceptance testing.
Batch and correct back to the “as received sample” gradation. For acceptance testing, determine the binder content per AASHTO T 308, then wash and grade the aggregates per AASHTO T 30, applying said correction factors.
4. Electronic Forms: CT version 1640 or CT version 1648 (RAP mixes) shall be used to report the aggregate gradations.
5. Data shall be submitted to the RE who will forward electronic copies to the PPG Working Group representative: Julia.Rockenstein@dot.ca.gov
6. Please feel free to call Julia Rockenstein at 858-302-7651 if you have any questions.

Replace **AASHTO T 308** at each occurrence in section 39 with:
AASHTO T 308 (Modified)

Add to the table in the 5th paragraph of section 39-2.01A(1):

AASHTO T 30	2019
-------------	------

Add between the 2nd and 3rd paragraphs of section 39-2.01A(4)(a):
AASHTO T 308 (Modified) is AASHTO T 308, except section A2.9.2 is modified as follows:

Determine the average difference for the two values. The aggregate correction factors (equal to the resultant average differences) for all sieves shall be applied to all acceptance gradation test results determined by T 30, prior to final rounding and reporting.

Replace the 1st paragraph of section 39-2.01B(4)(b) with:
Test for aggregate gradation under AASHTO T 30.

Add to the table in the 1st paragraph of section 39-2.02A(4)(b)(ii):

Gradation	AASHTO T 27	Once per day – Report only
-----------	-------------	----------------------------

Replace **AASHTO T 27** in the row for **Gradation** in the table in the 1st paragraph of section 39-2.02A(4)(b)(ii) with:
AASHTO T 30

Delete footnote *a* in the table in the 1st paragraph of section 39-2.02A(4)(b)(ii).

Replace **AASHTO T 27** in the row for **Aggregate gradation** in the table in item 1 in the paragraph of section 39-2.02A(4)(e) with:
AASHTO T 30

Delete footnote *a* for the table in item 1 in the paragraph of section 39-2.02A(4)(e)

Replace **AASHTO T 27** in the row for **Gradation** in the table in the 1st paragraph of section 39-2.03A(4)(c)(iii) with:
AASHTO T 30

Replace **AASHTO T 27** in the row for **Aggregate gradation** in the table in item 1 in the list in the paragraph of section 39-2.03A(4)(e)(i) with:

Replace *AASHTO T 27* in the row for *Aggregate gradation* in the table in item 1 in the list in the paragraph of section 39-2.04A(4)(c)(i) with:

AASHTO T 30



WORKSHEET FOR IGNITION FURNACE BINDER CORRECTION FACTOR AASHTO T 308

Source: _____ HMA Type: _____ RAP: ☐ Date: _____

Sample ID: _____ Tested by: _____

Target binder content, % by mass of Mix: _____ % by mass of Agg: _____ Test temperature, (°C): _____

Ignition Furnace Manufacturer: _____ Serial #: _____ Location of Furnace: _____

		Trial No. 1		Trial No. 2
(A) Initial “battered” bowl mass, g				
(B) Final bowl mass ¹ , g				
(C) Bowl mass difference, (B – A), g				
(D) Dry aggregate mass, g				
(E) Aggregate & binder mass, g				
(F) Binder mass, (E – D), g				
(G) Corrected binder mass, (F – C), g				
(H) Actual binder content by mixture mass, (G / (D + G) * 100), %				
(I) Sample basket assembly mass, g				
(J) Sample basket assembly & mix mass ² , g				
(K) Mix mass ³ , (J – I), g				
(L) Ignition furnace binder content, % by mass of mix				
(M) Correction factor, (L – H), %	L1		L2	
(N) Average correction factor ⁴ , ((L1 + L2) / 2), %		Average		
(O) Difference in correction factor ⁵ , (L1 – L2), %		Difference	0.00	

¹ Scrape the bowl until the final mass is within ± 0.5 grams of the initial “battered” mass.

² After placing the basket assembly and mix into the ignition furnace verify that the displayed mass and the mass recorded in (J) agree within ± 5 grams.

³ Be certain to enter (K), the mix mass into the ignition furnace control panel prior to initiating the burn cycle.

⁴ If the correction-factor exceeds 1.0%, lower the test temperature to 482 °C and repeat the test. Use the correction factor at 482 °C even if it exceeds 1.0%.

⁵ If the difference is greater than ± 0.15 percent, run two more samples and discard the high and low test results.

Remarks:



WORKSHEET FOR IGNITION FURNACE BINDER CORRECTION FACTOR AASHTO T 308

Source: _____ HMA Type: _____ RAP: ☐ Date: _____

Sample ID: _____ Tested by: _____

Target binder content, % by mass of Mix: _____ % by mass of Agg: _____ Test temperature, (°C): _____

Ignition Furnace Manufacturer: _____ Serial #: _____ Location of Furnace: _____

Aggregate Gradation Correction Factor (% Passing)

Sieve Size	Trial #1	Trial #2	"blank"	Trial #1 Difference	Trial #2 Difference	Average Difference	Allowable Difference
1" / 25mm							
3/4" / 19 mm							
1/2" / 12.5 mm							
3/8" / 9.5 mm							
#4 / 4.75 mm							
#8 / 2.36 mm							
#30 / 600 µm							
#50 / 300 µm							
#100 / 150 µm							
#200 / 75 µm							

Handwash: ☐ Mechanical Wash: ☐ Time: _____

Remarks:



WORKSHEET FOR IGNITION FURNACE BINDER CORRECTION FACTOR AND AGGREGATE GRADATION CORRECTION FACTOR FOR MIXES INCLUDING RAP

Source: _____ Date: _____

Sample ID: _____ Tested by: _____ Test Temp, (°C) _____

Target binder content, % by mass of Mix: _____ Binder content, RAP, % by mass of RAP: _____

Ignition Furnace Manufacturer: _____ Serial #: _____ Location of Furnace _____

	Trial No. 1	Trial No. 2
(A) Initial "battered" bowl mass, g		
(B) Final bowl mass ¹ , g		
(C) Bowl mass difference, (B - A), g		
(D) Mass of RAP, g		
(E) Mass of RAP Aggregate, g (D - D*(RAP/100))		
(F) Mass of RAP Binder, g (D*(RAP/100))		
(G) Dry Virgin Aggregate mass, g		
(H) Virgin Binder mass ²		
(I) Total Binder mass, (F+H), g		
(J) Corrected binder mass, (I - C), g		
(K) Actual binder content by mixture mass, (J / (D + G + H)) * 100, %		
(L) Sample basket assembly mass, g		
(M) Sample basket assembly & mix mass ³ , g		
(N) Mix mass ⁴ , (M - L), g		
(O) Ignition furnace binder content by mass of mix, %		
(P) Correction factor, (O - K), %	P1	P2
(Q) Average correction factor ⁵ , ((P1 + P2) / 2), %	Average	
(R) Difference in correction factor ⁶ , P1 - P2 , %	Difference	0.00

¹ Scrape the bowl until the final mass is within ± 0.5 grams of the initial "battered" mass.

² For guidance on determining required virgin asphalt content see the FLH Addendum to AASHTO T 308: Correction Factors for Hot Mix Asphalt (HMA) Containing Recycled Asphalt Pavement (RAP) Example 1.4.

³ After placing the basket assembly and mix into the ignition furnace verify that the displayed mass and the mass recorded in (M) agree within ± 5 grams.

⁴ Be certain to enter (N), the mix mass into the ignition furnace control panel prior to initiating the burn cycle.

⁵ If the correction-factor exceeds 1.0%, lower the test temperature to 482 °C and repeat the test. Use the correction factor at 482 °C even if it exceeds 1.0%.

⁶ If the difference is greater than ± 0.15 percent, run two more samples and discard the high and low test results.

Remarks:



WORKSHEET FOR IGNITION FURNACE BINDER CORRECTION FACTOR AND AGGREGATE GRADATION CORRECTION FACTOR FOR MIXES INCLUDING RAP

Source: _____ Date: _____

Sample ID: _____ Tested by: _____ Test Temp, (°C) _____

Target binder content, % by mass of Mix: _____ Binder content, RAP, % by mass of RAP: _____

Ignition Furnace Manufacturer: _____ Serial #: _____ Location of Furnace _____

Mix Composition, % mass of Mix: **Virgin Agg:** _____ **RAP:** _____

Mix Composition, % mass of Agg.: **Virgin Agg:** _____ **RAP Agg:** _____

☐ English

☐ Metric

Aggregate Gradation Correction Factor (AASHTO T 30, Sieve Analysis, % Passing)

Sieve Size	Trial #1	Trial #2	Virgin Agg. Gradation "blank"	Burnt RAP Agg. Gradation "blank"	Calculated "blank"	Trial #1 Difference	Trial #2 Difference	Average Difference	Allowable Difference
1" / 25mm									±5.0
3/4" / 19 mm									±5.0
1/2" / 12.5 mm									±5.0
3/8" / 9.5 mm									±5.0
#4 / 4.75 mm									±5.0
#8 / 2.36 mm									±5.0
#30 / 600 µm									±3.0
#50 / 300 µm									±3.0
#100 / 150 µm									±3.0
#200 / 75 µm									±0.5

Handwash: ☐ Mechanical Wash: ☐ Time: _____

Remarks:

