

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

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- 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

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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.






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Recommendation and Approval

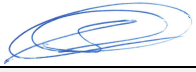



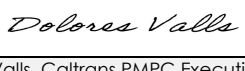
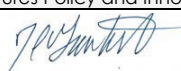
This scoping document for Post Production Aggregate Gradation was prepared by Asphalt Subtask Group to address a priority issue with statewide significance and is within the Pavement & Materials Partnering Committee mission as described in the Pavement & Materials Partnering Committee Charter. The Subtask 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