CALTRANS / INDUSTRY
Rock Products Committee

Performance Graded Asphalt Rubber

Project Work Plan

November 1, 2013

Asphalt Task Group

Performance Graded Asphalt Rubber Sub Task Group

Updated 11-27-13

Performance Graded Asphalt Rubber
Work Plan
Table of Contents

Performance Graded Asphalt Rubber
Work Plan

This project work plan is for the development of a performance graded specification for asphalt rubber binder that contains crumb rubber particle size up to 2.38mm (8 mesh) with consideration of climate zone. If the work proves successful the goal is to replace the current recipe-specification with the developed performance graded asphalt rubber (PG-AR) specification and associated testing protocols and to implement the PG-AR specification through a Certificate of Compliance (COC) program. The intent of this work plan is to document the project scope, schedule, roles and responsibilities, and expected outcomes so that the Department of Transportation (Caltrans) and Industry have the same understanding and expectations regarding this project. The work plan for this project is based upon the priorities developed between Caltrans and Industry through the Rock Products Committee – Asphalt Task Group, and is intended to be a guide for the Sub Task Group for the development of deliverables. This work plan communicates to Task Group and RPC Co-Chairs the necessary project activities, resources required and timeline to complete the project.

Project Background

Asphalt binders are most commonly graded by their physical properties. Superpave research led to new binder tests and specifications that more accurately characterize asphalt binders used in hot mix asphalt. Performance grading is based on the idea that asphalt binder properties should be related to the conditions under which it is used and asphalt binders are selected to meet expected climatic conditions as well as aging considerations with a certain level of reliability. Performance grading uses a common set of tests to measure these physical properties of the binder that can be directly related to field performance of the pavement at various temperatures. Caltrans began to use the PG specifications for neat asphalt binders on January 1, 2006 and for polymer modified asphalt binders one year later.

Over the past several years progress has been made in developing a performance graded specification for asphalt binders containing particulate crumb rubber using the existing ASTM D7175 and AASHTO T315 procedures. One significant modification to the existing procedures is the gap size of the plates on the Dynamic Sheer Rheometer (DSR) used for high temperature grading. For testing asphalt rubber binders, the specified 1mm gap needs to be widened because of the particle-on-particle interference which affects testing repeatability/reproducibility. Recently, the Asphalt Binder Expert Task Group (ETG) has recommended to AASHTO that the Standard T315 be modified to allow for the use of a 2mm gap on the 25mm plates for binders containing crumb rubber particles as large as 600µm (30 mesh).

Dr. John D'Angelo, a nationally recognized expert in asphalt rheology, has been working on the performance grading for asphalt binders containing crumb rubber. His work focuses on the DSR using a Cup and Bob geometry vs. the plate-on-plate

and used crumb rubber with particle size less than 600µm (30 mesh). His work shows promise for the development of a specification for asphalt rubber binder. However, at this time there are equipment handling issues and his work does not address the larger crumb rubber particles commonly used in asphalt rubber binder used in California.

More recently in California, testing has been done using an asphalt rubber binder which contains particle size up to 2.38mm (8 mesh). Extensive testing has led to the use of a 3mm gap on both the 25mm and 8mm plates with good repeatability. The performance tests for the aged and low temperature properties are also repeatable. This has led to the beginning stages of round robin testing to verify the repeatability of the test results for asphalt rubber binder which contains larger particles of crumb rubber. The above effort demonstrates that with appropriate modification of the testing equipment and/or testing procedures it is feasible to develop a PG specification for asphalt rubber binder containing larger crumb rubber particles.

Project Scope

The scope of the Performance Graded Asphalt Rubber project encompasses the following:

Phase 1

- Determine any necessary changes to the PG test methods and/or PG test equipment for PG-AR testing.
- Develop any additional test methods and equipment that should be used to performance grade asphalt rubber binder.
- Develop a preliminary PG-AR specification and associated testing protocols for asphalt rubber binder.
- Monitor the efforts of the Pacific Coast Conference on Asphalt Specifications (PCCAS) through which round robin testing of PG-AR is being coordinated. This will include industry and agency labs in multiple states.
- Characterize the asphalt rubber binder that is being used in the round robin test, including the asphalt grade, crumb rubber properties, and other ingredients formulating the asphalt rubber binder.
- Include the preliminary PG-AR specification as “report only” for use on pilot Caltrans Seal Coat and RHMA projects.
- Analyze the initial round robin test data to determine the feasibility of using the proposed PG grading test procedures for asphalt rubber binder. Finalize a preliminary PG specification for asphalt rubber binder.

Phase 2

- Upon the successful completion of the phase 1, develop a program for the second round robin test that will include multiple binders, suppliers, and/or samples from the pilot Caltrans projects.
- Create a roster of volunteer testing laboratories and equipment manufacturers for participating in the round robin test program.
- Analyze data from round robin tests and develop precision and bias for test methods used for PG-AR and improve the preliminary PG-AR specification.

- Develop a COC program for implementing the improved PG-AR specification.
- Recommend appropriate PG-AR grades for use in RHMA and for seal coat spray application based on climate zones.
- Analyze the second round robin data and PG-AR test results gathered as "report only" from the pilot Caltrans Seal Coat and RHMA projects to finalize the PG-AR specification.
- Construct additional pilot projects to implement the improved PG-AR specification and the COC program.
- Coordinate a workshop to share and discuss the data collected. Facilitate a discussion on any changes to the PG procedures deemed necessary. These recommendations will be relayed to the PCCAS to consider for the second, more extensive round robin test.

Phase 3

- Explore new tests such as the Multiple Stress Creep Recovery (AASHTO TP-70) for potential inclusion in the asphalt rubber binder specification.
- Develop guidelines and support program for the use of the PG-AR specification.

Changes to the project scope will be discussed with the RPC Co-Chairs and agreement will be obtained prior to carrying out any such change.

Guiding Principles

The following principles should guide the Sub Task Group in the development of the PG-AR specification, associated testing protocols, and the COC Program.

- Decisions made during the development of the PG-AR specification, associated testing protocols, and the COC Program will be based on data substantiated through lab and/or field validation.
- All points of view will be considered and respected.
- Supporting documents and guidelines produced by third party agencies will be considered within the context that they were promulgated.
- Development of the PG-AR specification, associated testing protocols, and the COC Program is a cooperative effort between Caltrans (including Pavements, Construction, and METS) and the Construction Industry (including materials suppliers).

Project Organization, Roles, and Responsibilities

A clear definition of the roles and responsibilities of each project team member and/or group helps to provide a better understanding of involvement, direction and accountability among participants in the project. The project's organizational structure is listed below and describes the roles and responsibilities of both groups and individuals who will participate in the project.

Project Sponsor, Peter Vacura — Communicates the project vision, and the organization's role in supporting that vision. The Project Sponsor:

- Is the ultimate owner of the project deliverables and is responsible for fulfilling responsibilities as defined by the RPC Asphalt Task Group;

- Has the authority to make decisions and responsibility for implementation of the Performance Graded Asphalt Rubber Testing Protocol and Certificate of Compliance Program within Caltrans;
- Promotes the project throughout Caltrans and is empowered to negotiate and provide solutions to Caltrans-level project issues.

RPC Asphalt Task Group—Caltrans management and Industry representatives who can make decisions regarding acceptability of deliverables. The role of the Task Group includes the following activities:

- Provide high-level direction and oversight over the project;
- Build consensus and provide leadership for the project;
- Communicate project objectives and status to peers, colleagues, and staff;
- Monitor Sub Task Group performance and assure quality of deliverable;
- Assist the Sub Task Group Co-Chairs in resolving issues and removing obstacles;
- Identify and provide subject matter experts and any additional resources necessary for the project.

Caltrans Sub Task Group Co-Chair, Haiping Zhou —The Caltrans Sub Task Group Co-Chair will provide overall leadership and direction to the project. The responsibilities of the Caltrans Sub Task Group Co-Chair include:

- Make or evaluate key project-related decisions;
- Share/provide operational knowledge;
- Identify project risks/issues and determine which should be elevated to the Task Group;
- Attend Task Group meetings to provide project status and solicit feedback and guidance;
- Assist the Sub Task Group in identifying and gaining access to key subject matters experts or other stakeholders;
- Serve as primary contact to the Sub Task Group;
- Schedule meetings with Caltrans subject matter experts and stakeholders;
- Participate in project status/issue meetings as required;
- Review all project deliverables;
- Coordinate and consolidate review comments on interim and final deliverables;
- Recommend for approval project deliverables in a timely and complete manner;

Industry Sub Task Group Co-chair, Mark Belshe, Rubber Pavements Association and Sallie Houston, VSS International —The responsibilities of the Industry Sub Task Group Co-Chair include:

- Review all project deliverables prior to submission to the Task Group;
- Plan and coordinate project activities as it pertains to Industry participation;
- Maintain open communication with the Project Sponsor and Caltrans Sub Task Group Co-Chair;
- Identify and/or validate project risks or issues that require escalation to the Task Group;
- Conduct meetings with Industry subject matter experts and stakeholders and document findings;

Caltrans Sub Task Group Members—Responsibilities of the Caltrans Sub Task Group members include:

- Provide program area expertise, input, guidance, thought leadership, and feedback to the Sub Task Group;
- Provide validation or additional information for Sub Task Group's findings;
- Actively participate in work sessions throughout the life of the project;
- Remain accessible to the Sub Task Group as a resource for information validation;
- Review project deliverables and provide comments to the Caltrans Sub Task Group Co-Chair in a timely manner, as necessary.

Specific Caltrans Divisions involved in the project include:

Construction – The Division of Construction is responsible for:

- Develop guidance specific to Construction field staff, including eventual updates to the Caltrans Construction Manual, if necessary;
- Mandatory specification concurrence for new and revised specifications.

The Division of Construction representative on this Sub Task Group is:
Chuck Suszko
Chief, Office of Construction Engineering

METS – Materials and Engineering Services is responsible for:

- Develop variations to existing California Tests, or create new California Tests, or provide verification of proposed ASTM or AASHTO tests;
- Certify district laboratories and district personnel on the performance of specified tests.

The METS representative on this Sub Task Group is:
Joe Peterson
Chief, Office of Roadway Materials Testing

Industry Sub Task Group Members—Responsibilities of the Industry Sub Task Group members include:

- Provide program area expertise, input, guidance, thought leadership, and feedback to the Sub Task Group;
- Provide validation or additional information for Sub Task Group's findings;
- Actively participate in work sessions throughout the life of the project;
- Remain accessible to the Sub Task Group as a resource for information validation;
- Review project deliverables and provide comments to the Industry Sub Task Co-Chair in a timely manner, as necessary.

Industry's representatives on this Sub Task Group are:
Jack Van Kirk, Basic Resources, Inc.
Jason Lampley, Intermountain Surfacing Systems
Michael Davenport, American Pavement Systems
Brian Orr, Paramount Petroleum
Tony Limas, Granite Construction Company
Shakir Shatnawi, Shatec Engineering Consultants
Brandon Milar, Mead WestVaco
Rita Leahy, California Asphalt Pavement Association

Other Sub Task Group Members—Responsibilities of the other Sub Task Group members include:

- Provide program area expertise, input, guidance, thought leadership, and feedback to the Sub Task Group;
- Provide validation or additional information for Sub Task Group's findings;
- Actively participate in work sessions throughout the life of the project;
- Remain accessible to the Sub Task Group as a resource for information validation;
- Review project deliverables and provide comments to the Sub Task Co-Chairs in a timely manner, as necessary.

Other entities involved with this project include:

The Federal Highways Administration representative on this Sub Task Group is:
Steve Healow
Asset Management and Pavements Engineer

The University of California Pavement Research Center representative on this Sub Task Group is:
Frank Farshidi

The California State University at Chico CP2 Center representative on this Sub Task Group is:
Roger Smith

Project Resource Requirements

To deliver the project efficiently and timely the following estimated resources are necessary:

Caltrans Staff		
Caltrans Sub Task Group Member	Person Years(PY's)	Hours Required
Pavements	0.5	1000
Construction	0.5	1000
METS	0.4	800
District	0.1	200

Industry Representatives		
Industry Sub Task Group Member	Time Period Required	Hours Required
Industry Participants	As Needed	As Needed

Subject Matter Experts (SME)		
SME Name	Time Period Required	Hours Required
Peter Vacura	10/1/2013 – 2/1/2015	300
Kee Foo	10/1/2013 – 2/1/2015	300
Chuck Suszko	10/1/2013 – 2/1/2015	300
Ebi Fini	10/1/2013 – 2/1/2015	700
Joe Peterson	10/1/2013 – 2/1/2015	300
Al Vasquez	10/1/2013 – 2/1/2015	500

Outside Resources		
Resource Type	Time Period Required	Cost
UCPRC	10/1/2013 – 2/1/2015	150,000
Chico State	10/1/2013 – 2/1/2015	150,000

The total resources to complete this project are:

- Caltrans staff, including SMEs: 3,000 hours
- Industry: As needed
- Outside resources: $300,000

Project Work Plan

This section describes each phase of the Performance Graded Asphalt Rubber project, the expected outcome of each phase, the methods of completing each phase, and the work products produced. The table below also identifies the necessary participants in order to complete the project phases.

Phase	Expected Outcome	Deliverables	Method	Participants
Phase 1	Work plan development	A comprehensive, executable work plan	• Champion develops reviewable draft • Sub Task Group members review and comment • Sub Task Group adopts final work plan	• Work plan Champion • Sub Task Group members
	Draft PG-AR specification and test protocols	Draft PG-AR Specification and associated test protocols for PG-AR	• Prepare draft of PG-AR Specification • Document test protocols used and make it available for second round robin test	• PG-AR Testing Champion • Caltrans Subject Matter Experts • Industry Subject Matter Experts
	Initial round robin test	Report of test results, determination of feasibility of preliminary test method.	• PCCAS round robin labs participation • Test results collated and analyzed	• PG-AR Testing Champion • PCCAS labs
	Draft PG-AR Specification for use on pilot Caltrans projects	Data collected from the pilot Caltrans projects that used draft PG-AR Specification	• Caltrans inserts draft spec for use on pilot projects	• PG-AR Testing Champion • Caltrans Subject Matter Experts
Phase 2	Testing protocols	Testing protocols and instructions for conducting tests	• Development of standard testing protocols for participating labs • Development of detailed instructions for sample preparation and necessary equipment adjustment/modification	• PG-AR Testing Champion • Caltrans Subject Matter Experts • Industry Subject Matter Experts

Phase	Expected Outcome	Deliverables	Method	Participants
	Second round robin test	Report of test results and analysis, including precision and bias of test protocols	• PCCAS and other round robin labs participation • Test results collated and analyzed • Draft of report prepared • Report accepted by Sub Task Group	• PG-AR Testing Champion • Caltrans Subject Matter Experts • Industry Subject Matter Experts
	Workshop	Presentation Materials	• Develop agenda • Identify speakers/moderators • Resolve logistics issues	• Workshop Champion • Caltrans Subject Matter Experts • Industry Subject Matter Experts
	PG-AR specification improvement	Improved PG-AR specification	• Circulation of documents to targeted stakeholders and subject-matter experts for review and comments • Resolution of comments received by the Sub Task Group • Documentation of comments and resolutions	• Sub Task Group • Caltrans Subject Matter Experts • Industry Subject Matter Experts • Stakeholders • Task Group • Project Sponsor
	COC program development	COC Program	• Circulation of documents to targeted stakeholders and subject-matter experts for review and comments • Resolution of comments received by the Sub Task Group • Documentation of comments and resolutions	• Sub Task Group • Caltrans Subject Matter Experts • Industry Subject Matter Experts • Stakeholders • Task Group • Project Sponsor
	PG-AR specification initial implementation	Construction of additional pilot projects	• Caltrans develops project specifications • Caltrans bids and awards contracts • Sub Task Group provides oversight and comment for specification refinement	• Caltrans Subject Matter Experts • Industry Subject Matter Experts • Project Sponsor

Phase	Expected Outcome	Deliverables	Method	Participants
Phase 3	New test exploration for PG-AR specification refinement	Potentially improved PG-AR specification including new test method(s)	• Gather input from lab and field practitioners • Draft new tests and specification modifications	• PG-AR testing Champion • Sub Task Group • Caltrans Subject Matter Experts • Industry Subject Matter Experts • Stakeholders
	Design guidelines	Design guidelines for PG-AR	• Gather input from lab and field practitioners • Present deliverables to Task Group for recommendation to Sponsor	• Sub Task Group • Caltrans Subject Matter Experts • Industry Subject Matter Experts • Task Group • Project Sponsor
	Construction guidelines	Construction guidelines for PG-AR	• Gather input from lab and field practitioners • Present deliverables to Task Group for recommendation to Sponsor	• Caltrans Subject Matter Experts • Industry Subject Matter Experts • Task Group • Project Sponsor
	Technical Advisory Guide (TAG) update	Updated TAG	• Present deliverables to Task Group for recommendation to Sponsor	• Caltrans Subject Matter Experts • Industry Subject Matter Experts • Task Group • Project Sponsor
	Implementation Report	Technical Support	• Codify technical support request procedure and response protocols	• Caltrans Subject Matter Experts • Industry Subject Matter Experts • Task Group • Project Sponsor

Deliverables and Delivery Dates

The project deliverables for Performance Graded Asphalt Rubber are described in the table below, with the anticipated date the documents will be delivered.

Deliverable	Anticipated Date
1. Project work plan	11/07/2013
2. Draft PG-AR specification and associated testing protocols	11/15/2013
3. Report of initial round robin test results	10/01/2013
4. Pilot projects using the draft PG-AR specification	10/15/2013
5. Testing protocols and instructions for conducting second round robin test	12/01/2013
6. Report of second round robin test results, analysis and precision and bias of test protocols	7/01/2014
7. Workshop with presentation materials	9/15/2014
8. Improved PG-AR specification	10/01/2014
9. Certificate of Compliance Program for PG-AR	12/01/2014
10. Additional pilot projects construction	10/30/2014
11. Potentially improved PG-AR specification including new test method(s)	2/01/2015
12. Design guidelines for PG-AR	2/01/2015
13. Construction guidelines for PG-AR	2/01/2015
14. Updated Technical Advisory Guide (TAG)	2/01/2015
15. Technical support for Implementation	2/01/2015

Quality Control

Caltrans will use internal quality reviews to verify the quality of project deliverables.

Communications and Reporting

The Sub Task Group will make use of the following communications mechanisms:

- **Status Meetings**—The Sub Task Group will meet as necessary to status progress and resolve issues;
- **Status Reports**—Caltrans will provide a written monthly status report to the Caltrans Project Sponsor that identifies activities completed during the period and issues tracked in the Issues Log;

- **Task Group Meetings**—Throughout the project, the Sub Task Group will communicate with the Task Group to provide information, obtain perspective, and gain approval for project direction.

Assumptions

The following assumptions were made in the development of this Project Work Plan:

1. Caltrans will be responsible for the development of the deliverables described in this document.
2. The Sub Task Group will have support from Caltrans and Industry leadership, management and employees.
3. Industry will be the testing and workshop champion for this project.

Recommendation and Approval

This work plan for Performance Graded Asphalt Rubber was prepared based on Rock Products Committee scoping document approved on August 5, 2013. The resources necessary and timeline for completing the deliverables are based on reasonable assumptions and the scope of the work presented.

Work plan recommended for approval by:

_____
Haiping Zhou
Caltrans Sub Task Group Co-Chair

Work plan approved by:

_____
Peter Vacura
Caltrans Task Group Co-Chair

_____
Joe Peterson
Caltrans Task Group Co-Chair

_____
Chuck Suszko
Caltrans Task Group Co-Chair

Approval Date: _____