

Department of Resources Recycling and Recovery

SCOPE OF WORK

Evaluation of Warm Mix Asphalt Technologies with Asphalt Rubber and Terminal Blends

I. INTRODUCTION/OBJECTIVES

The objectives of this project are as follows:

- Evaluate the use of warm mix technologies for asphalt-rubber (AR) and terminal blend hot mixes and quantify the benefits of producing the mixes at lower temperatures without harming the performance of the mix.
- Evaluate the use of warm mix technologies for use in spray binders, especially AR spray binders. This could result in significant energy savings and a reduction in the emissions. It would also be necessary to determine the effect on short term and long-term performance.
- Work with Caltrans, local agencies, and industry to place additional trials or test sections of warm mix products in California.
- Quantify the expected savings in energy costs and emission reductions for several of the most prominent warm mix additive technologies.

II. WORK TO BE PERFORMED

This contract entails the evaluation of the energy savings and environmental (emissions reductions) benefits that may result from the use of warm mix additive technologies in conjunction with AR and terminal blend materials (hot mix and chip seal). The first task will be an evaluation of what has occurred to date, both nationwide and within California. The second task will be to develop a database to record pertinent production and construction parameters of existing (past) projects. Tasks three and four involve conducting laboratory testing and in-field monitoring of new projects as they are constructed to expand the database and knowledge base of using warm mix technologies with rubberized asphalt materials. Task five will involve sharing with industry and agencies the lessons learned through the analysis of the database information and project experiences. Task six entails the reporting and presentation of the findings of the study to CalRecycle staff.

III. TASKS IDENTIFIED

Task 1 – Literature/Project Review

There are several applications/locations in California where various warm mix additives were used in paving projects, including:

Santa Clara in 2007; SR 94 near San Diego in 2009; I-5 near Orland in 2009; SR-70 near Marysville in 2009; US 101 in Caltrans District1 in 2009; US 99 from Sacramento County Line north to Feather River-2009.

The contractor will work with Caltrans and industry to document the performance of these sections as well as determine the potential energy savings and emission reductions when using warm mix technologies. In addition, Caltrans is proposing to construct another 5-10 projects using asphalt rubber with warm mix and RAC technologies in 2010, which will also be included in this study. The contractor will also contact the warm mix industry to determine the extent of warm mix applications with asphalt rubber or terminal blends elsewhere in the world. It may be necessary to visit some of the sites in the USA and obtain documentation of work done internationally.

Task 2 - Develop a database for all projects

The contractor will develop a computerized database for all warm mix projects placed by Caltrans and/or local agencies in California. The database will include the performance of existing warm mix projects and construction information. This will include at least the following:

- Mix design information
- Construction information including mix temperatures and energy consumption when using warm mix technologies
- Emissions information, if available
- Project construction location
- Initial performance including photos and evaluation reports, if available

Task 3 - Laboratory testing for warm mix projects

This task will include the testing of the performance-related properties of terminal blend and asphalt rubber binders. Equipment may be purchased to facilitate testing and may include the following:

- Dynamic Shear Rheometer (DSR)
- Pressure Aging Vessel (PAV)
- Rolling thin film oven (RTFO)
- Haake Viscometer
- Cone penetration tester
- Ring and Ball Softening point
- Ductility
- Elastic Recovery

Title to all equipment purchased shall remain vested in CalRecycle and all equipment shall be turned over to CalRecycle at the conclusion of the contract.

Task 4 -Monitor existing projects and develop and monitor new test projects.

Monitor all existing hot-mix projects using warm mix technologies. This will include the following;

- Monitor construction related parameters, including:
 - Mix temperatures during production and compaction using infrared camera and/or other temperature monitoring devices
 - Emissions, visual and measured
 - Energy consumption during material production (may be supplied by the producer or calculated)
 - QC/QA data, from the contractor and agency
- Pavement condition surveys (ride, distress and overall surface appearance)

The contractor will work with Caltrans and local agencies to facilitate the monitoring of field applications of terminal blends, RHMA-G and RHMA-O as well as AR chip seal using the warm mix technologies. This would include both the construction and initial performance of the new field projects as shown above. The contractor will also provide technical support, expertise, and help with planning, evaluation, and technical reports to agencies that need such assistance.

Task 5 – Seek input and disseminate the knowledge

Prepare papers, conduct stakeholder workshop, technical memos, and reports to disseminate the knowledge of using warm mix technologies with asphalt rubber and terminal blend overlays and chip seals. This may include information on projects not only in California but elsewhere in the United States.

Task 6 - Final report

This task will consist of the preparation of a final report summarizing the activities and findings of the contract and present the results to CalRecycle staff.

IV. CONTRACT/TASK TIME FRAME

(Some tasks will overlap in time)

Task #	Completion Date
1. Literature review	10/15/10
2. Develop a database for all projects	01/14/11
3. Laboratory testing for warm mix projects	01/31/12
4. Monitor existing projects and develop and monitor new test projects	01/31/12
5. Disseminate the knowledge	04/16/12
6. Final report	05/01/12
TOTAL	24 months

V. COPYRIGHT PROVISION

The Contractor shall assign to the Department of Resources Recycling and Recovery (CalRecycle) any and all rights, title and interests to any copyrightable material or trademarkable material created or developed in whole or in any part as a result of this Agreement, including the right to register for copyright or trademark of such materials. The Contractor shall require that its subcontractors agree that all such materials shall be the property of the CalRecycle. Such title will include exclusive copyrights and trademarks in the name of the CalRecycle.

VI. CALIFORNIA WASTE TIRES

Unless otherwise provided for in this Scope of Work, in the event the Contractor and/or subcontractor(s) purchases waste tires or waste-tire derived products for the performance of this Scope of Work, only California waste tires and California waste tire-derived products shall be used. As a condition of payment under the agreement, the Contractor shall be required to provide documentation substantiating the source of the tire materials used during the performance of this Scope of Work to the CalRecycle Contract Manager.

VII. WASTE REDUCTION AND RECYCLED-CONTENT PRODUCT PROCUREMENT

In the performance of this Agreement, Contractor shall use recycled content, used or reusable products, and practice other waste reduction measures where feasible and appropriate.

Recycled Content Products: All products purchased and charged/billed to CalRecycle to fulfill the requirements of this contract shall be Recycled Content Products (RCPs), or used (reused, remanufactured, refurbished) products. All RCPs purchased or charged/billed to CalRecycle to fulfill the requirements of the contract shall have both the total recycled-content (TRC) and the postconsumer content (PC) clearly identified on the products. Specific requirements for the aforementioned purchases and identification are discussed in the Terms and Conditions of the Contractual Agreement under Recycled-Content Product Purchasing and Certification.

The Contractor should, at a minimum, ensure that the following issues are addressed, as applicable to the services provided:

A. WRITTEN DOCUMENT PROVISION

All documents and/or reports drafted for publication by or for CalRecycle in accordance with this contract shall adhere to the CalRecycle's *Guidelines For Preparing CalRecycle Reports (available upon request)* and shall be reviewed by CalRecycle's Contract Manager in consultation with one of CalRecycle's editors.

In addition, these documents and/or reports shall be printed double-sided on one hundred percent (100%) recycled-content paper. Specific pages containing full-color photographs or other ink-intensive graphics may be printed on photographic paper. The paper should identify the postconsumer recycled content of the paper (i.e., “printed on 100% postconsumer paper”). When applicable, the Contractor shall provide the Contract Manager with an electronic copy of the document and/or report for CalRecycle’s uses.

To the greatest extent possible, soy ink instead of petroleum-based inks should be used to print all documents.