

Maximizing the Use of Recycled Asphalt on Road Construction and Preservation Projects

Paula Hammond
Secretary of Transportation

Kathleen Davis
Director, Highways & Local Programs

Aaron Butters
Highways & Local Programs Engineering Services Manager

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Department of Transportation

Executive Summary - RAP Proviso Report

The 2007-2009 Transportation Budget (Appendix A) Section 221 (8) contains proviso language connected with the Washington State Department of Transportation's (WSDOT) use of Recycled Asphalt Pavement (RAP).

"The department shall work with the Department of Ecology, the County Road Administration Board, and the Transportation Improvement Board to develop model procedures and municipal and state rules in regard to maximizing the use of recycled asphalt on road construction and preservation projects. The Department shall report to the Joint Transportation Committee by December 1, 2008, with recommendations on increasing the use of recycled asphalt at the state and local level."

There are three requirements of the proviso:

1. Develop model procedures in regard to maximizing the use of recycled asphalt pavement (RAP) on road construction and preservation projects.
2. Develop municipal and state rules to maximize the use of RAP on road construction and preservation projects.
3. Provide a report to the Joint Transportation Committee with recommendations on increasing the use of RAP at the state and local level.

Recycled Asphalt Pavement, or RAP, is asphalt pavement material that has been removed from a road, driveway, or other surface. Typically the material is removed in preparation for repaving or other roadway improvements. This material can be mixed with new aggregate, sand, and asphalt binder to create Hot Mix Asphalt (HMA) to be used for paving new driving surfaces or mixed with other materials for use as fill material. This is considered cost effective and environmentally responsible.

WSDOT has addressed the first objective of the proviso, developing model procedures for the use of RAP, beginning in the mid 1970's and has continued into the present. A summary titled "RAP in Washington State" is included in this report.

WSDOT has met the objective of item two of the proviso above by developing Standard Specifications, or rules, that allow and govern the use of RAP on transportation projects. The rules and procedures for using RAP are documented in the *WSDOT Standard Specifications for Road, Bridge, and Municipal Construction*. Current WSDOT Standard Specifications allow the use of RAP in amounts up to twenty percent of the total weight of the aggregate in HMA, and also allow its use as roadway base and fill material. These specifications have been part of the WSDOT Standard Specifications since 1988.

A Local Agency Task Force was formed to review the third requirement of the proviso: Information on the current use of RAP by WSDOT and local agencies, and to offer suggestions to increase its use. The Task Force was made up of members of WSDOT, Washington Department of Ecology, Association of Washington Cities, and the County Road Advisory Committee. Results of that review are contained in this report and its appendices.

Recycled Asphalt Pavement Report Card

Asphalt pavement is the most recycled material in the USA. According to the Asphalt Pavement Alliance “Americans are now recycling 28 percent of products in the municipal solid waste stream. For some industrial products, the recycling rate is much higher, and reclaimed asphalt pavement leads all at 80 percent. In fact, the hot mix asphalt industry recycles approximately twice the tonnage of asphalt pavement as the amount of recycled paper, glass, plastic, and aluminum combined.”

See Appendix A.

Survey

RAP use by WSDOT is well developed. Standard specifications allow up to twenty percent RAP in any hot mix asphalt paving, without the need for additional testing compared to mixes made with 100 percent virgin aggregates. The use of RAP by local agencies is less clear. To develop context for this report, the committee created a survey to give an overview of the current practice of RAP use within the state. A summary of the survey results provides insight into our current level of use and a potential direction for increasing RAP use in public works projects.

Our survey asked city and county officials about their current practices regarding the use of RAP. We asked the following:

1. Does your agency have a policy, specification, or ordinance that prohibits the use of RAP on your construction projects?
2. Are there other barriers to the use of RAP in your agency?
3. Do you use asphalt waste for reclamation or fill material in pit sites under your agency's control?
4. How many tons of Hot Mix Asphalt do you plan to place this year?
5. Does your agency allow the use of RAP as:
 - a. Component of HMA
 - b. Base under HMA
 - c. Base under other material
 - d. Fill material on shoulder or in embankment
 - e. Other
6. Has your agency experienced a problem using RAP in any application?
7. Does your agency have road projects that require asphalt disposal?

A total of 197 city and county officials were asked to participate in the survey; we received 61 responses. Of the 61 responses, four agencies said they prohibit the use of RAP in Hot Mix Asphalt and of those four, three allow the use of RAP in other applications such as base material under roadways and embankments. The one remaining respondent does not allow RAP in its public works projects.

Key Findings:

- Over 92 percent of the agencies who responded allow and use RAP in their HMA mixes,
- Over 98 percent of the agencies who responded allow and use RAP in some application on their public works projects, and
- Less than two percent of the responding agencies prohibit the use of RAP in any application, citing negative experiences as the reason

Discussions with the Washington State Department of Ecology reveal that it is impossible to accurately determine how much, if any, RAP may end up in a landfill. Possible categories of disposal would be listed as “Inert” or “Demolition” on the form that disposal sites use for tracking and reporting, but whether or not RAP was included in the load was unavailable.

Question number seven was added to help determine if any RAP was being disposed of in public landfills. Although some grinding debris is removed from the public works sites, the contractors have indicated they use this material for RAP. There is incentive to recycle the product because it can be used to replace equal amounts of virgin material.

The 23 asphalt plants in Washington were also asked to participate in a survey to establish where there may be restrictions on the use of RAP from the industry perspective.

Our survey asked the asphalt producers these questions:

1. Does your company use RAP in HMA mix designs?
2. Do you have customers that do not allow RAP in their paving mixes?
3. If the answer to #2 is yes, what category of customer are they?
4. Do you have difficulty using all the RAP available to you?
5. What is your primary source of RAP?

There were nine responses from this group, representing 39% of the industry by volume.

Of the plants responding to the survey, three report they do not use RAP in HMA. One of the plants reported they cannot use the amount of RAP that they accumulate, but went on to say that is because the plant is not equipped to utilize RAP in HMA production. We learned from the agency survey that the customers utilizing this plant say that they do allow RAP in their mixes if it's available.

We can conclude from the Industry survey that:

- Approximately 33 percent of the responding asphalt plants do not use RAP in their HMA.
- Three of the nine responding asphalt plants report they have city and county customers that do not allow RAP in HMA.

- One plant is not equipped to use RAP in HMA production. That plant is also the only plant that says it can't use all the RAP they accumulate in a normal construction season.
- Responses to the last question tell us that the primary source of RAP is ground asphalt pavement from public works projects. Some plants comment that they also accept material from private contractors.

See Appendix B for the complete list of survey responses.

Development of Washington State Specifications

The Washington State Department of Transportation (WSDOT) has participated in research for different uses of Recycled Asphalt Pavement (RAP) since the 1970s.

The WSDOT Standard Specifications for Road, Bridge, and Municipal Construction first incorporated RAP for use on projects in the 1988 edition. Prior to that time RAP was used on projects as a "Special Provision" starting in 1977

See Appendix C for a summary of the development of this specification and related research projects.

WSDOT constructed its first hot-mix asphalt recycling project in 1977. The project incorporated 12,400 tons of RAP. From that time forward, WSDOT has continued to refine and adjust the Standard Specifications to its current version. This allows RAP to be used for up to twenty percent of the total weight of the aggregate in the mix.

See Appendix D for WSDOT Standard Specification 5-04.2.

WSDOT Standard Specifications also provide for the use of RAP in applications other than Hot Mix Asphalt, as well as the use of other recycled materials.

From the survey results, we find that the local agencies that do not allow the use of RAP in HMA have had negative experiences that resulted in rules or specifications that prohibit its use.

The number of agencies that do not allow RAP is small. Public outreach and education on the value of the material as an environmental stewardship issue, and as a cost saving value in their budgets, may increase the quantity of RAP currently used by local agencies within the state.

To develop the education and outreach effort, we have asked an existing task force of WSDOT, Washington Asphalt Pavement Association, and local agency representatives for assistance. The group's primary objective is to develop revisions to the WSDOT Standard Specifications for local agency use and to

provide overall guidance for the use of HMA on local agency projects. Part of the program for this task force includes training and public outreach to be made available to local agencies. Use of RAP will be part of the education and outreach developed by this task force.

Washington State has approximately 43,707 miles of asphalt roadway surface. This number includes Interstate miles to local access routes. (These roadways are broken down by type in Appendix E.) Preservation and maintenance of these miles of roadway are the responsibility of the Washington State Department of Transportation, the 39 counties and 281 cities within the state. Of the many concerns these agencies share, the appropriate use of Hot Mix Asphalt as a roadway surface is the most complex. For this reason, WSDOT has performed research into different methods and materials for paving and the use of all types of recycled products in our projects.

Use of other asphalt products, such as shingles, is experimental and has not been fully developed by WSDOT at this time. Facilities for processing this material to make it suitable for incorporating it into HMA are limited. Unlike roadway pavements that have known properties, the components of other asphalt products like shingles are often unknown, which can cause unpredictable results. Varying amounts of different substances can contaminate the products, making them hazardous to health and the environment. The WSDOT Materials Lab is investigating the use of shingles in HMA but has not yet found it to be suitable.

Other methods that are being used within the state presently include Cold In-Place Recycling (CIR) and Warm Mix Asphalt (WMA) which are technologies that help reduce the amount of energy used to produce paving mixes and provide other avenues for the use of RAP.

See Appendix E for information on Cold In-Place Recycling in Washington.

WSDOT built its first WMA project in the state during the 2008 construction season on I-90 near George. The project incorporated approximately 4724 tons of WMA. WMA technology has been used successfully in other areas of the country, and the performance of the product will be evaluated over time.

See Appendix F for research information on WMA.

Research continues for ways to expand our commitment to the use of recycled products. As technologies develop, WSDOT will continue to evaluate and incorporate them as appropriate.

Conclusions

Based on survey responses, the number of local agencies that do not allow the use of RAP is small.

Also based on the survey, asphalt pavement suppliers do not report having large quantities of RAP they can't use. Therefore we conclude that Washington State cities and counties are all utilizing the potential of RAP with the current rules.

Finally, the asphalt paving companies in Washington provide a location for recycling asphalt pavement by other contractors, which reduces the amount of material going to landfills.

WSDOT has developed model guidelines and rules for incorporating RAP in public works projects that, if followed, provide many opportunities for recycling this valuable building material.

A report by Walt Olsen of the County Road Advisory Board titled "*Asphalt Recycling in Washington State Counties*" summarizes this issue well.

"Over enthusiastic use of the recycling methods merely for the sake of increasing the appearance of environmental responsibility could lead to some projects costing more than is beneficial and failing to perform as advertised. The resulting failures would reinforce eroding public opinion of the local government's ability to deliver on the promise to invest the public's tax dollars wisely. Limitations exist with all methods of asphalt recycling and only sound engineering judgment and experienced contractors will produce the results necessary to satisfy the cost and environmental opportunities of the processes."

The report goes on to say;

"While the opportunity to maximize the use of recycled asphalt products is a laudable goal, there are challenges and pitfalls to be faced. Results can be achieved over time if there is cooperation and commitment by the State Legislature, Department of Transportation, the 39 counties of the state and the asphalt producers and recyclers of Washington."

See Appendix H for the complete text.

WSDOT concurs with this statement and will continue to move forward to find new ways to increase the use of RAP in public works projects.

Recommendations for increasing the use of RAP in Public Works Projects in Washington State.

- 1. Continue work in progress with the Hot Mix Asphalt (HMA) for Local Agencies Task Force to develop training on the use of HMA in general, and the benefits of using Recycled Asphalt Pavement (RAP) as part of the HMA program.*
- 2. Continue researching different types of recycled products that can benefit both the environment and budgets of all agencies that perform public works projects.*
- 3. Continue researching WMA and other technologies that can potentially utilize a larger portion of RAP to virgin material, as well as lower overall energy consumption during paving operations.*
- 4. No legislation is necessary to insure use of all available RAP due to the risk of increased production costs.*

There is a built-in incentive for asphalt suppliers to utilize as much RAP as possible. The practice can amount to considerable savings over virgin material which reduces the overall cost of producing HMA. Educating Washington's city and county public works sector on the benefit and potential savings for RAP will be included in future HMA training by the HMA for Local Agencies Task Force.

Appendices

- A – ACP Asphalt Pavement Alliance on Recycle
- B – Survey Responses
- C – Recycled Asphalt Pavement in Washington, project summaries copies of the entire body of each report are available on request
- D – WSDOT Standard Specification 5-04.2
- E – FHWA Miles by Type of Surface
- F – Cold In-Place Recycling
- G – Warm Mix Asphalt

To save on printing costs, appendices are available electronically at ftp://ftp.wsdot.wa.gov/dotshare/hlp/RAP_Appendices/