

# INFOBRIEF



With changes in construction materials economics, stricter environmental regulations, and an emphasis on “green” technologies (e.g., warm mix asphalt) and sustainable pavements, the highway community is reassessing the economic and environmental benefits of allowing higher percentages of reclaimed asphalt pavement (RAP) in premium pavements and asphalt surfaces while maintaining high-quality pavement infrastructure. In 2007, the Federal Highway Administration created the RAP Expert Task Group (ETG) to advance the use of recycled materials such as RAP and recycled asphalt shingles in asphalt paving applications. The purpose of the ETG is to provide State transportation departments and the industry with information that emphasizes the production of high-quality, high-content RAP mixtures, the performance of asphalt mixtures containing RAP, technical guidance on high-content RAP projects, and RAP research activities. Members of the RAP ETG consist of representatives from State highway agencies, industry, and academia. This InfoBrief summarizes the accomplishments of the RAP ETG and resources available for increased RAP use. More information may be found online at [www.fhwa.dot.gov/pavement/recycling](http://www.fhwa.dot.gov/pavement/recycling) or at [www.moreRAP.us](http://www.moreRAP.us), as well as through the National Asphalt Pavement Association and the Asphalt Institute.



<http://www.fhwa.dot.gov/research/>

## High Reclaimed Asphalt Pavement Use

FHWA Publication No.: FHWA-HRT-11-057

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### RAP Defined

Existing asphalt materials are commonly removed during resurfacing, rehabilitation, and reconstruction operations. Once removed and processed, the pavement materials become reclaimed asphalt pavement (RAP), which contains valuable asphalt binder and aggregate. RAP is a valuable, high-quality material that can replace more expensive virgin aggregates and binders. The most economical use of RAP is in the intermediate and surface layers of flexible pavements where the less expensive binder from RAP can replace a portion of the more expensive virgin binder. While RAP has been used for decades, there is a current interest in using higher RAP contents. High RAP content mixtures have greater than 25 percent RAP by weight of the mix.

### RAP Use Today

The RAP ETG, in partnership with the American Association of State Highway and Transportation Officials (AASHTO), conducts a RAP use survey every 2 years. The survey was conducted in 2007, 2009, and 2011. In 2007, the typical hot mix asphalt (HMA) mixture contained about 12 percent RAP. From 2007 to 2009, about 27 States increased the amount of RAP permitted in asphalt mixtures, and, as of 2009, 23 States have experience with high RAP mixtures. The results of the 2007 and 2009 surveys are summarized in the *Public Roads* article “Reclaiming Roads.”<sup>(1)</sup> As of 2011, the majority of State highway agencies (more than 40) allow more than 30 percent RAP; however, only 11 report actually using 25 percent RAP or more.<sup>(2)</sup>

### Providing Technical Information

#### Designing High RAP Mixes

The RAP ETG developed and disseminated technical information for high RAP use. In the first major effort, the Federal Highway Administration partnered with AASHTO and the National Asphalt Pavement Association to create *Designing HMA Mixtures with High RAP Content: A Practical Guide*, which provides guidance for designing high RAP mixtures.<sup>(3)</sup> As a follow-up and in conjunction with the Transportation Research Board, the RAP ETG conducted the webinar *Design and Production of High Reclaimed Asphalt Pavement Mixes*.<sup>(4)</sup>

#### Management and Production Best Practices

There are two best practices reports available.<sup>(5,6)</sup> In addition, presentations by three RAP ETG members are available, which provide a historical

perspective on HMA recycling, sources of RAP materials, and RAP inventory management, processing, sampling, and testing. It also provides information on the selection of virgin asphalt binder grade, the combination of warm mix asphalt and RAP, and the performance of high RAP content mixes.<sup>(7)</sup>

## Performance

The long-term performance of recycled asphalt pavements, particularly when compared to conventional HMA performance, has not been well documented. The National Center for Asphalt Technology completed a study comparing virgin and recycled asphalt pavements using data from the Long-Term Pavement Performance (LTPP) program.<sup>(8)</sup> It was concluded that, in most cases, using 30 percent RAP in an asphalt pavement can provide the same overall performance as virgin asphalt pavement. In a separate LTPP analysis to determine the impact of design features on performance, 18 sites with RAP were examined. The performance data show that RAP and virgin mixes used in overlays of flexible pavements showed approximately the same performance across a range of climates, traffic, and existing pavement conditions over a period of up to 17 years.<sup>(9,10)</sup> Based on past experience, asphalt mixtures containing RAP designed with established mixture design procedures and produced with appropriate quality assurance measures perform comparably to conventional asphalt mixtures.

To provide guidance for increasing RAP use while ensuring performance, the RAP ETG created a guide, *How to Increase RAP Usage and Ensure Pavement Performance*.<sup>(11)</sup>

## Moving Forward

The RAP ETG will continue to provide technical information for proper RAP use in asphalt pavements. Major efforts include working closely with the National Cooperative Highway Research Program (NCHRP) on research projects related to RAP use (e.g., NCHRP Project 9-43 and developing research needs statements) and providing input to AASHTO to update standards for RAP use.<sup>(12)</sup>

## References

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