



REQUIRING FRACTIONATION FOR HIGH RAP MIXES

March 2023
Version 1.0

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ABSTRACT

In this guidance document, we will review best practices for stockpile management for Reclaimed Asphalt Pavement (RAP).

This guidance document covers the best practices for stockpile management of reclaimed asphalt pavement (RAP) as of 2019. The goal of this document is to reinforce the need for fractionation of RAP for asphalt mixes of >25% RAP (total binder replacement) within the San Diego region to improve the sustainability of asphalt pavements. This guidance document will provide guidance for stockpiling RAP, testing RAP, sampling RAP, and explain the local need for utilizing higher RAP within the San Diego region.

Good RAP management practices are important to ensure the greatest economic benefit of these materials and the highest quality asphalt mixes. Fractionation methods were designed to separate the stockpile into predetermined sizes to control the variability of gradation and binder contribution, both of which can adversely affect the volumetric mix design properties when reused in new pavements.

Key Issues:

- San Diego virgin aggregate reserves are quickly depleting, so the use of RAP in asphalt mix designs is more important than ever
- Improper stockpile management can decrease the quality of RAP, making it unusable in asphalt mix designs
- Insufficient testing of RAP stockpiles can lead to inconsistent asphalt mixes, which can result in premature failure of asphalt pavement



REQUIRING FRACTIONATION FOR HIGH RAP MIXES

PROBLEM STATEMENT

Improper stockpile management can decrease the quality of RAP and therefore limits its use as a recyclable material.

San Diego aggregate reserves are depleting faster than we are currently replenishing them with new permitted facilities. The San Diego region is within 11–20 years of completely exhausting local sources of virgin aggregates used in construction materials production according to the California Geological Survey report of 2018. Utilizing high RAP asphalt mixes extends the life of currently permitted aggregates facilities within the San Diego region.

Without the fractionation of RAP at >25% asphalt binder replacement, the utilization of high RAP

content in a wide variety of mix types is limited because of lack of proper controls needed to meet the specific volumetric and gradational specifications. Lack of stockpile controls can lead to segregation and high moisture content in RAP.

Lack of proper testing or insufficient testing frequency can lead to inconsistent asphalt mixes, both of which affects the quality of the material characteristics and causes premature failure of asphalt pavement.



REQUIRING FRACTIONATION FOR HIGH RAP MIXES

SOLUTION

Proper stockpile management focuses on limiting segregation and moisture intrusion to maintain quality RAP.

Best Practices for Stockpile Management
(all these methods may not apply for all situations or facilities)

- **Stockpile Management – Best Practices**
 - Build stockpile in layers to minimize the potential for segregation.
 - Don't push over the edge of the stockpile slope (NAPA QIS 129) Att #2.
 - Feed loader from the side of the stockpile, working up through the layers (NAPA QIS 129) Att #2.
- **Stockpile Management – Fractionated stockpiles mitigate segregation**
 - Ability to move the conveyor to the head of the stockpile to minimize the kinetic energy generated by larger particles that force these particles to the bottom of the stockpile while the finer particles stay at the top of the pile.
 - Fluff the material with a loader prior to placing in a hopper. Mixing the material will lend itself to a more uniform and consistent feed into the plant.



REQUIRING FRACTIONATION FOR HIGH RAP MIXES

- **Stockpile Management – Fractionated stockpiles mitigating moisture**
 - If possible, covering of the stockpile is a good practice prior to heavy rains.
 - Use conical stockpiles to naturally shed off the rainwater.
 - Place the stockpile on a paved and sloped surface to help water drain easily from the pile.
 - If possible, place the stockpile in an open sided shed (shelter) that will allow moisture accumulation to escape while protecting the RAP material from rain.
 - Try and keep the stockpile height to 30 feet to reduce the potential for self-consolidation (NAPA QIS 129). Should a stockpile of over feet be necessary, please reach out to the National Asphalt Paving Association (NAPA) and request some literature on the best practices for managing such stockpiles.
- **Fractionation of Multiple Sizes**
 - The number of sizes that the RAP is fractionated should be at the manufacturer's discretion, but at no time should ever be less than two sizes per Caltrans specifications 39-2.02B(5) (2022), if the manufacturer plans on using only the fine RAP fractionation a course stockpile is not required. The need for fractionating to very specific sizes can be dependent on specific mix specifications.
 - Fractionating RAP for mixes >25% may give the manufacturer the ability to decrease the amount of the fine portion that can allow for increased RAP content in mixes that have tighter limits on the material passing the #200 screen and the dust to asphalt ratio.
 - Sampling and Testing Frequency Per Section 39-2.02A(4)(b)(iii) Reclaimed Asphalt Pavement of the Caltrans 2015 Standard Specifications.

Key Take-aways:

- Proper RAP stockpile management mitigates segregation and moisture
- Fractionating RAP gives the manufacturer flexibility in incorporating more RAP into mix designs and can increase the quality of higher RAP mixes
- Caltrans specifications dictate the best standard of sampling and testing frequencies

REQUIRING FRACTIONATION FOR HIGH RAP MIXES

CONCLUSION

Implementing best practices for stockpile management allows for more quality RAP to be incorporated and used in asphalt mix designs.

With the local aggregate crisis in San Diego, there is a need to investigate alternative solutions to maximize aggregate sustainability. With only 11–20 years of aggregate reserves remaining, implementing a plan to stretch the available natural reserves is vital. Utilizing higher RAP content in asphalt mixes allows us to preserve the available natural resources locally while also minimizing our carbon footprint. By utilizing more RAP in asphalt, we will cut down on our need for transportation by utilizing local materials and makes sure we keep these products that are 100% recyclable out of our local landfills.

A disciplined approach to RAP management—one based on data to manage inventory, processing, uniformity, and quality—will maximize the return on investment in materials, equipment, and manpower. The best practices provided in this guidance document are a great starting point for change with the understanding that these practices will evolve and continue to improve the more we communicate and mitigate these challenges as a unified front.



REQUIRING FRACTIONATION FOR HIGH RAP MIXES

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