



INSTRUCTIONS FOR RAM IN ASPHALT MIXTURES

1. GENERAL

This IM describes requirements for processing, storing, documenting, and sampling & testing of Recycled Asphalt Materials (RAM) intended for use in asphalt mixtures. RAM shall apply to Recycled Asphalt Pavement (RAP) and Recycled Asphalt Shingles (RAS). The allowable use of RAS is defined in the applicable standard, supplemental, and/or developmental specifications.

All notifications and documentation shall be submitted to the District Materials Engineer (DME) based on the District responsible for the location of the initial RAM stockpile.

2. PROCESSING

A) **RAP**

RAP suitable for HMA shall be processed by milling and/or crushing to a maximum particle size of 1.5 inches (37.5 mm). The Contractor shall notify the Engineer and DME 48 hours before processing begins.

Additional screening or blending may be done to achieve a more uniform stockpile. This processing may be done as the stockpile is built or as part of the HMA plant production. Additional actions that may improve the consistency of the RAP include further crushing to reduce top size, screening into coarse and fine fractions, or blending by proportioning through a calibrated two-bin cold feed. Each individual RAP stockpile being incorporated into HMA must have a dedicated totalizer for measuring quantities during production. When using multiple RAP stockpiles for a single mix, if the required number of totalizers are not available pre-blend the piles to the JMF proportions under the direction of the DME.

B) **RAS**

End users of RAS which also receive raw, unprocessed shingles and process the material for incorporation into an asphalt mixture, shall be considered a shingle Supplier and must adhere to [Materials IM 506](#).

3. STORAGE

A) **RAP**

Placed stockpiles on a base with adequate drainage, constructed in layers to minimize RAP segregation and ensure a workable face.

To meet Classified RAP criteria, separate stockpiles shall be constructed for each source of RAP based on the quality of aggregate, type and quantity of asphalt binder, and size of processed material. Notify the Engineer and DME 48 hours prior to blending Classified or Certified RAP materials of the same aggregate quality to retain



Classified or Certified status.

All RAP stockpiles shall be identified by maps of stockpile areas and signs placed in or near each stockpile.

B) RAS

Place stockpiles on a base with adequate drainage sufficient to prevent contamination.

Separately stockpile pre-consumer RAS from post-consumer (tear-off) RAS. RAS may be pre-blended with RAP under the direction of the Engineer. Notify the Engineer and DME 48 hours prior to blending RAS materials with other materials or adding to a RAS stockpile. Equipment must be calibrated to ensure proper proportioning of blended piles. The Engineer may require verification testing for asphalt content, gradation, aggregate specific gravity, aggregate absorption, and fine aggregate angularity before the pile may be used.

All RAS stockpiles shall be identified by maps of stockpile areas and signs placed in or near each stockpile.

4. DOCUMENTATION OF CERTIFIED RAP STOCKPILES

A) RAP

Stockpiled RAP material will only retain its Classified or Certified status when the following documentation requirements are met. No documentation is required when the RAP is used on the project it came from, or a tied project.

- Form 820009r (see Appendix A) is completed by the RAP owner and a copy is forwarded to the DME within 10 calendar days of completing the stockpile.
- Any special handling, treatment or conditions of the RAP or its use should be described on this form.
- Maps shall provide details that depict the stockpile site, including adjacent stockpiles of RAP or aggregates, permanent plant equipment, and landmarks.
- Maps and signs shall identify the stockpile by RAP Identification Number.

The DME will review for accuracy. Portions of the form including assigning the RAP identification number, aggregate quality type, crushed particle and friction type credit, average values for extracted aggregate gradation, aggregate bulk specific gravity, aggregate absorption and asphalt binder content will be completed by the DME.

Notify the DME at least 48 hours before relocating or reprocessing a Classified RAP or Certified RAP stockpile for future use (not intended for a specific project). The notification shall include the estimated quantity of RAP being relocated or reprocessed and the new location of the stockpile. Relocation of RAP shall be reported on the appropriate Form (820009r) and submitted to the DME within 10 calendar days of completing the relocation. Reprocessing a Classified RAP or Certified RAP stockpile may require additional sampling, testing, and a new Form (820009r) with reassignment



of a RAP Identification Number.

Before January 1st of each year, the Contractor shall update Form 820009r on the status of each Classified RAP and Certified RAP stockpile. Report the estimated quantity of RAP removed for the construction season completed and the available RAP in each stockpile for future use.

B) RAS

The following documentation is required for owners of stockpiled RAS:

- Form 82009ras is completed by the stockpile owner and a copy is forwarded to the DME within 10 calendar days of completing the stockpile.
- Any special handling, treatment or conditions of the RAS should be described on this form.
- A record of addition and consumption of the RAS stockpile should be documented on this form.
- Maps shall provide details that depict the stockpile site, including adjacent stockpiles of RAP or aggregates, permanent plant equipment, and landmarks.
- Maps and signs shall identify the stockpile by RAP Identification Number.

The DME will review forms for accuracy. Portions of the form including assigning the stockpile identification number, average values for extracted aggregate gradation, and asphalt binder content will be completed by the DME.

Notify the DME at least 48 hours before relocating or reprocessing a RAS stockpile for future use (not intended for a specific project). The notification shall include the estimated quantity of RAS being relocated or reprocessed and the new location of the stockpile. Relocation of RAS shall be reported on the appropriate Form (820009ras) and submitted to the DME within 10 calendar days of completing the relocation. Reprocessing a RAS stockpile may require additional sampling, testing, and a new Form (820009ras) with reassignment of a RAS Identification Number.

Before January 1st of each year, the Contractor shall update Form 820009ras on the status of each RAS stockpile. Report the estimated quantity of RAS removed for the construction season completed and the available RAS in each stockpile for future use.

5. SAMPLING & TESTING

i) Mix Design

A) RAP

A certified Level I Aggregate Technician shall obtain the samples. Samples for mix design testing shall be obtained from at least 3 locations. Significant mixture differences in the pavement to be recycled may require separate stockpiles and samples. A sampling plan shall be developed by the Contractor and approved by the DME prior to sampling.



Samples for mix design obtained from the RAP stockpile are the most representative, but not always possible when the mix designs are performed. When stockpile samples are not available, RAP samples shall be obtained by milling a minimum of 50 feet (15 m) of project length at each sample location. Other methods of sampling for mix design, including coring or air-hammer patch areas, may only be used with the approval of the DME.

Obtain sufficient material for contractor mix design testing and owner agency RAP extraction testing as recommended in [Materials I.M. 510](#). A representative 30 pound (15 kg) sample split from the total sample shall be delivered to the District Materials Laboratory for extraction testing. Results of the extraction test will be provided to the Contractor within 4 weeks of sample delivery.

B) RAS

When RAS is to be used on an existing contract, the DOT will perform mix design testing on samples from the certified stockpile dedicated to the project at the plant. Samples may also be collected at an in-state source. For out-of-state sources, the DME may approve mix design sampling and testing to be coordinated by the Contractor and Supplier at a qualified lab for preliminary information. Mix designs may then be given conditional approval pending DOT results. When the Contractor retains possession of the RAS, the DOT will sample and test. DOT results shall be available prior to start-up. Adjustments to the mix design may be required.

When mix design development needs to be expedited for an active DOT contract and the Supplier has not had sufficient time to certify the pile's quality (gradation and deleterious content), extraction samples may be taken by the District directly at the Supplier's site provided the material is certified free of asbestos containing materials (ACM). Provide a certification letter to the DME using guidelines in [Materials IM 506 Appendix E](#). The Central lab will run extraction and material quality (gradation and deleterious content) testing on the sample. In the event of a failing quality test, the District may sample and test (gradation and deleterious) again after the Supplier has certified the material quality.

A certified Level I Aggregate Technician shall obtain the samples. RAS shall be sampled using methods similar to those for fine aggregate. Samples for mix design testing shall be obtained from at least 3 locations. A sampling plan shall be developed by the Contractor and approved by the DME prior to sampling.

Obtain sufficient material for contractor mix design testing and owner agency extraction testing as recommended in [Materials I.M. 510](#). Samples shall be witnessed and secured. A representative 30 pound (15 kg) sample split from the total sample shall be delivered to the District Materials Laboratory for extraction testing. Results of the extraction test will be provided to the Contractor within 4 weeks of sample delivery.

Include extracted asphalt content and dry RAS gradation in testing.

In lieu of a sieve analysis on the extracted aggregate, the following gradation may be



assumed for the RAS aggregate:

Shingle Aggregate Gradation	
Sieve Size	Percent Passing by Weight
3/8 in. (9.5 mm)	100
No. 4 (4.75 mm)	95
No. 8 (2.36 mm)	85
No. 16 (1.18 mm)	70
No. 30 (600 µm)	50
No. 50 (300 µm)	45
No. 100 (150 µm)	35
No. 200 (75 µm)	25

ii) Classified RAP Quality Control

When the contractor elects to perform RAP quality control, use one of the following quality control sampling programs. A certified Level I Aggregate Technician shall obtain the samples.

- Stockpiles – The Contractor shall obtain a representative sample of RAP from the stockpile for each 1000 tons of RAP placed in the stockpile.
- HMA Plant – The Contractor shall obtain a representative sample of RAP from the HMA plant RAP feed belt for each 7000 tons of HMA produced.

The Contractor shall use the ignition oven ([Materials IM 338](#)) or chemical extraction (AASHTO T 164) to extract the aggregate from the RAP sample. Calibration of the asphalt binder content from the ignition oven extraction is not required for the RAP quality control program. The gradation of the extracted RAP aggregate and the un-calibrated asphalt binder content shall be logged and charted within 24 hours of sampling. Report results to the DME upon completion of testing.

iii) Certifying RAP Stockpiles

To retain Certified RAP status, the stockpile shall be uniform in gradation and binder content. The contractor shall perform ignition oven ([Materials IM 338](#)) testing for aggregate gradation and binder content at 1/1000 tons as the stockpile is built or during processing of the stockpile. Regardless of tonnage, a minimum of three tests shall be required. Interior samples from the stockpile cross section shall be included in quality control testing. The contractor shall perform and report aggregate specific gravity and absorption testing at the above frequencies. Retain a split portion of each sample for testing by the Iowa DOT.

Gradation and asphalt content uniformity will be based on the standard deviation requirements listed in Table 1. If the Contractor results satisfy the requirements in Table 1, the District will select a sample to test a burn-off gradation and binder content for verification. If the tolerances in [IM 216](#) are met, the Contractor’s results will be validated and the pile will be certified. Log, chart, and report all test results to the DME.



Table 1: Variability requirements for Certified RAP

Property	Maximum Standard Deviation
1 ½ (% Passing)	6.5
1 (% Passing)	6.5
¾ (% Passing)	6.5
(% Passing)	6.5
#4 (% Passing)	6.5
#8 (% Passing)	6.5
#30 (% Passing)	4.5
#200 (% Passing)	2.2
Asphalt Content (%)	0.70

The DME will provide notification of Certified status when the above requirements are satisfied.