



**SUPPLEMENTAL SPECIFICATIONS
FOR
RECYCLED ASPHALT PAVEMENT (RAP)**

**Effective Date
January 20, 2010**

THE STANDARD SPECIFICATIONS, SERIES 2009, ARE AMENDED BY THE FOLLOWING MODIFICATIONS AND ADDITIONS. THESE ARE SUPPLEMENTAL SPECIFICATIONS AND THEY SHALL PREVAIL OVER THOSE PUBLISHED IN THE STANDARD SPECIFICATIONS.

This specification applies to projects on the Primary Road System only. It may apply to other projects when specifically identified in the contract documents.

Replace all of Article 2303.02, C with the following:

C. Recycled Asphalt Pavement (RAP)

RAP is salvaged asphalt pavement. RAP shall be from a source designated in the contract documents, a Classified RAP stockpile, a Certified RAP stockpile, or Unclassified RAP furnished by the Contractor. The designations Classified, Certified, and Unclassified are exclusively for the use of RAP in HMA.

~~The Contractor shall identify~~ Identify each RAP stockpile and document Classified and Certified RAP stockpiles as directed in Appendix A. Information required for documentation of Classified RAP material in a stockpile for future use in HMA shall include identification of the project from which the material was removed; mix data from the original project including mixture type, aggregate classification, location and depth in the pavement structure; extracted gradation information, if available; and description of stockpile location and quantity. Additional material shall not be added to a Classified or Certified RAP stockpile without the approval of the District Materials Engineer.

The Engineer may reject a RAP stockpile for non-uniformity based on visual inspection. Stockpiles shall be worked in such a manner that the materials removed are representative of a cross section of the pile.

~~Stockpiles of RAP shall be placed~~ Place stockpiles on a base sufficient to prevent contamination as directed in Appendix A. RAP stockpiles containing concrete chunks, grass, dirt, wood, metal, coal tar, or other foreign or environmentally restricted materials shall not be used. RAP stockpiles may include PCC (not to exceed 10% of the stockpile) from patches or composite pavement that was milled as part of the asphalt pavement.

When RAP is taken from a project, or is furnished by the Contracting Authority, the contract documents will indicate quantity of RAP expected to be available and test information, if known. The Contractor is responsible for salvaging this material. Unless otherwise specified in the contract documents, RAP not used in HMA shall become the property of the Contractor.

For HMA mix design purposes, the Contracting Authority will test samples of the RAP. The aggregate gradation and amount of asphalt binder in the RAP will be based on the Contract Authority's extraction tests. When the amount of ~~RAP recycled~~ binder exceeds 20% of the total asphalt binder, change the asphalt binder grade as directed in Materials IM 510.

1. Classified RAP.

Classified RAP is from a documented source with the aggregate meeting the appropriate quality requirements in Materials IM 510, and properly stockpiled.

~~Classified RAP may be used in the base, intermediate, and surface mixtures for which the RAP aggregate qualifies. The surface course may use up to 15% of Classified RAP. The Contractor may use more than 15% of Classified RAP for the surface course when there is quality control sampling and testing of the RAP meeting the requirements in Appendix A. Not more than 30% of the total asphalt binder in the surface mix shall come from the RAP.~~

Classified RAP may be used in the base, intermediate, and surface mixtures for which the RAP aggregate qualifies in accordance with Appendix C.

Credit for the +4 proportion of friction aggregate may be given for virgin aggregates used in the original pavement to be reclaimed. Types 4 and 5 frictional aggregate content in the RAP may be given full credit, while Types 2 and 3 content may be given credit for half the proportion in the original pavement. Credit may be used toward the total frictional aggregate requirement. No frictional credit shall be given beyond one generation of the RAP's service life.

2. Certified RAP.

Any stockpiled RAP not meeting the requirements of Classified RAP or from an unknown source may be given a Certified status when meeting quality control sampling and testing requirements in Appendix A. Certified RAP may be used in accordance with Appendix C.

23. Unclassified RAP.

Any stockpiled RAP not meeting the requirements of Classified RAP or Certified RAP shall be designated as Unclassified RAP. ~~For Interstate and Primary projects, up to 10% Unclassified RAP may be used in HMA base and shoulder mixtures. For Primary projects, up to 10% Unclassified RAP may be used for equal to or less than 1,000,000 ESAL intermediate mixtures. For all other projects, up to 10% Unclassified RAP may be used in HMA base, intermediate, and shoulder mixtures. Unclassified RAP may be used in accordance with Appendix C. There will be no~~ No frictional aggregate credit or aggregate crushed particles credit ~~will be given~~ for Unclassified RAP.

When an Unclassified RAP stockpile is characterized by sampling and testing for mix design, no material can be added to the stockpile until the project is completed.

Replace all of Article ~~2303.05~~ 2303.04, C with the following:

C. Recycled Asphalt Pavement.

~~The quantity of asphalt binder in classified or unclassified RAP, which is incorporated into the mix, will be calculated in tons (megagrams) of asphalt binder in the RAP, based on the actual asphalt binder content determined for the mix design from the results of the Engineer's extraction test.~~

The quantity of asphalt binder in classified or unclassified RAP, which is incorporated into the mix, will be included in the quantity of asphalt binder used.

1. A completed Daily HMA Plant Report with the certification statement is required for measurement and payment for Contractor Certified HMA. The quantity of asphalt binder will be based on the approved JMF and any plant production quality control adjustments.
2. The quantity of asphalt binder in RAP that is incorporated into the mix will be calculated in tons (megagrams) of asphalt binder in the RAP. This quantity shall be based on the actual asphalt binder content determined for the mix design from the results of the Engineer's extraction tests.
3. The quantity of asphalt binder in RAP, which is incorporated into the mix, will be included in the quantity of asphalt binder used.

Replace the second paragraph of Article 2303.06, B with the following:

~~Payment for asphalt binder will be for all new asphalt binder and the asphalt binder in the RAP which is incorporated in the mixture.~~

The quantity of asphalt binder in classified or unclassified RAP, which is incorporated into the mix, will be calculated in tons (megagrams) of asphalt binder in the RAP. This will be based on the actual asphalt binder content determined for the mix design from the results of the Engineer's extraction test.

Replace item 2 of Article 2303.05, B with the following:

2. Payment for asphalt binder will be for new asphalt binder and the asphalt binder in the RAP which is incorporated in the mixture. The quantity of asphalt binder in RAP, which is incorporated into the mix, will be calculated in tons (megagrams) of asphalt binder in the RAP. This will be based on the actual asphalt binder content determined for the mix design from the results of the Engineer's extraction test.

Appendix A – Instructions for RAP in HMA Mixtures (Supersedes Materials IM 505)

GENERAL

This Appendix describes requirements for processing, storing, documenting, and sampling & testing of RAP intended for use in HMA mixtures.

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

PROCESSING

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 District Materials Engineer 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 two-bin cold feed.

STORAGE

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. ~~The Contractor shall notify~~ Notify the Engineer and District Materials Engineer 48 hours prior to blending Classified or Certified RAP materials of the same source, type and quantity of asphalt binder, and size of processed material 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.

DOCUMENTATION of CLASSIFIED RAP STOCKPILES

Stockpiled RAP material will only ~~be considered Classified RAP~~ 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 B) is completed by the RAP owner and a copy is forwarded to the District Materials Engineer 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 District Materials Engineer will review ~~Form 820009r~~ forms 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 District Materials Engineer.

Notify the District Materials Engineer 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 District Materials Engineer 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.

SAMPLING AND TESTING

Mix Design

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 District Materials Engineer 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 District Materials Engineer.

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.

Classified RAP Quality Control

When RAP quality control is required, 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 lot 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 District Materials Engineer upon completion of testing.

Certified RAP Quality Control

To retain Certified RAP status, the stockpile shall be uniform in gradation and binder content. Perform ignition oven (Materials IM 338) or chemical extraction (AASHTO T164) 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. Use a consistent test procedure for obtaining binder content and gradation. 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. The Iowa DOT will select a sample to test for verification. Log, chart, and report all test results to the DME.

Gradation and asphalt content uniformity will be based on the following standard deviation requirements:

| Property | Maximum Standard Deviation |
|---------------------|----------------------------|
| 1 ½ (% Passing) | 6.5 |
| 1 (% Passing) | 6.5 |
| ¾ (% Passing) | 6.5 |
| ⅜ (% 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.

Appendix B -- ~~Classified~~ RAP Stockpile Report (Form 820009r)

820009r (~~December 2005~~ January 2010)

| | | | | | |
|--|---|---|--------------------|------------------|--|
| Classified RAP Stockpile Report | | RAP Stockpile ID # | | | |
| <input type="checkbox"/> Classified | <input type="checkbox"/> Certified | | | | |
| Stockpile Owner: | | | | | |
| SOURCE OF RAP (Classified only) | | Project No. | | Dates of Removal | |
| Route No. | From Milepost | | To Milepost | | |
| | | | | | |
| Removal Depth | JMF No(s) | Mix Type / Size | Crushed Particle % | | |
| | | | | | |
| LOCATION OF RAP STOCKPILE: | | | | | |
| County | | Section | Township | Range | |
| Description of stockpile base: | | | | | |
| Processing remarks: | | | | | |
| STOCKPILE QUANTITY INVENTORY LOG | | | | | |
| Date | Quantity | Disposition (Project No. and use) | | | |
| | | <i>Total initial stockpile quantity</i> | | | |
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| Average EXTRACTION TEST RESULTS | | Aggregate Characteristics | | | |
| Gradation | Lab Report nos. | Aggregate Type | | | |
| 3 / 4 | Moisture % = | Aggregate Type | | | |
| 1 / 2 | | Crushed Particles | % | | |
| 3 / 8 | Pb = | Aggregate Type | | | |
| No. 4 | | Aggr Friction Type 2 | % | | |
| No. 8 | Gsb = | Aggregate Type | | | |
| No. 16 | | Aggr Friction Type 3 | % | | |
| No. 30 | Abs% = | Aggregate Type | | | |
| No. 50 | | Aggr Friction Type 4 | % | | |
| No. 100 | FAA = | Aggregate Type | | | |
| No. 200 | | | | | |
| <i>Shaded boxes to be completed by the District Materials Engineer</i> | | | | | |
| Stockpile Owner Representative | | | | Date | |
| District Materials Representative | | | | Date | |

Appendix C – Allowable RAP Usage

| Mix Designation | Aggregate Quality Type | Maximum Allowable Usage ^{2,3} | | |
|---------------------|------------------------|--|---------------|---|
| | | Unclassified RAP | Certified RAP | Classified RAP |
| HMA 100K S | B | 0% | 10% | 15% (min. 70% virgin binder) ¹ |
| HMA 100K I | B | 10% | 20% | No Limit |
| HMA 100K B | B | 10% | 20% | No Limit |
| HMA 300K S | B | 0% | 10% | 15% (min. 70% virgin binder) ¹ |
| HMA 300K I | B | 10% | 20% | No Limit |
| HMA 300K B | B | 10% | 20% | No Limit |
| HMA 1M S L-4 | A | 0% | 0% | 15% (min. 70% virgin binder) ¹ |
| HMA 1M S | A | 0% | 0% | 15% (min. 70% virgin binder) ¹ |
| HMA 1M I | B | 10% | 20% | No Limit |
| HMA 1M B | B | 10% | 20% | No Limit |
| HMA 1M B (shoulder) | B | 10% | 20% | No Limit |
| HMA 3M S L-4 | A | 0% | 0% | 15% (min. 70% virgin binder) ¹ |
| HMA 3M S L-3 | A | 0% | 0% | 15% (min. 70% virgin binder) ¹ |
| HMA 3M S | A | 0% | 0% | 15% (min. 70% virgin binder) ¹ |
| HMA 3M I | A | 0% | 0% | No Limit |
| HMA 3M B | B | 10% | 20% | No Limit |
| HMA 10M S L-3 | A | 0% | 0% | 15% (min. 70% virgin binder) ¹ |
| HMA 10M I | A | 0% | 0% | No Limit |
| HMA 10M B | B | 10% | 20% | No Limit |
| HMA 30M S L-3 | A | 0% | 0% | 15% (min. 70% virgin binder) ¹ |
| HMA 30M S L-2 | A | 0% | 0% | 15% (min. 70% virgin binder) ¹ |
| HMA 30M I | A | 0% | 0% | No Limit |
| HMA 30M B | B | 10% | 20% | No Limit |
| HMA 100M S L-2 | A | 0% | 0% | 15% (min. 70% virgin binder) ¹ |
| HMA 100M I | A | 0% | 0% | No Limit |
| HMA 100M B | B | 10% | 20% | No Limit |

Note:

1. The Contractor may use more than 15% of Classified RAP for the surface course when there is quality control sampling and testing of the RAP meeting the requirements in Appendix A. At least 70% of the total asphalt binder in the surface mix shall be virgin.
2. Maximum percentages shown are not to be combined.