



Recycled Asphalt

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INTRODUCTION

Recycled Asphalt Pavement, or RAP, is commonly used as a component of new asphalt. Washington State Department of Transportation (WSDOT) allows the use of up to 20% RAP in new pavement.

Asphalt shingles can be processed into a ground product and used for road applications such as hot mix asphalt (HMA) pavement and cold patch. In King County, the Solid Waste Division estimates that 40,000 tons of asphalt shingle waste is disposed each year. While some shingles are being recycled, local end markets for the material are not well established. HMA paving is considered the highest and best end use for this material.

WSDOT will be allowing recycled asphalt shingles in paving on select projects in 2012. The absence of a state specification that allows RAS in paving has been a significant barrier to recycling asphalt shingles from re-roofing projects locally.

REGULATIONS

[WSDOT Standard Specifications](#) – RAP in HMA

5-04 Hot Mix Asphalt
5-04.2 Materials

The Contractor may choose to utilize recycled asphalt pavement (RAP) in the production of HMA. If utilized, the amount of RAP shall not exceed 20-percent of the total weight of the HMA. The RAP may be from pavements removed under the Contract, if any, or pavement material from an existing stockpile.

USAGE HISTORY AND EXPERIENCE

King County and their contractors routinely use up to 20% RAP in road paving.

In 2009, The King County LinkUp Program, Solid Waste Division worked with the King County Roads Services Division to do a Recycle Asphalt Shingles (RAS) in Roads demonstration project.

BID AND CONTRACT LANGUAGE

King County Roads Division in consultation with the Solid Waste Division did a 2009 demonstration project:

Asphalt Shingle Paving Demonstration, #C00455C09, June, 2009
RAS Specification

King County Solid Waste Division project:

SWD Work Order Asphalt Services, #C00672C11, 10/10/2011
RAS Specification

[2010 Recycled Asphalt Shingles Specification Guidelines](#) - For Contracting Agencies specifying RAS to be used in Hot Mix Asphalt

FOR MORE INFORMATION

[Washington State Department of Transportation Standard Specifications for Road, Bridge, and Municipal Construction](#)

[Washington Asphalt Pavement Association](#)

[Federal Highway Administration](#)

[Preliminary Investigation of RAP and RAS in HMAC: Final Report](#), Oregon Dept. of Transportation, 2010.

[Asphalt Shingles](#), King County LinkUp program

Information about the shingles in paving demonstration project

[2010 Recycled Asphalt Shingles Specification Guidelines](#) - For Contracting Agencies specifying RAS to be used in Hot Mix Asphalt

[Shingles in Paving Demonstration Post-Construction Pavement Condition](#)

September 2010

This report summarizes post-construction pavement conditions on SE 416th Street following approximately one year of traffic use. In September 2009 the roadway was overlaid with a 2-inch thick layer of Hot Mix Asphalt (HMA) incorporating both Recycled Asphalt Pavement (RAP) and Recycled Asphalt Shingles (RAS) in designated test sections.

[Shingles in Paving Project: Paving Demonstration report](#)

February 2010

- [Shingles in Paving Project: Paving Demonstration report appendices](#)

VENDOR INFORMATION

List King County vendors:

Woodworth & Company (now Miles Resources) – for demonstration project

[Northwest Asphalt](#) (for SWD job)

SE 416th Street Recycled Asphalt Shingle (RAS) Paving Demonstration**8-23.4 MEASUREMENT**

This section is deleted in its entirety.

8-23.5 PAYMENT

This section is deleted in its entirety and replaced with the following:

All costs for providing, installing, removing, and disposing of temporary pavement markings shall be included in the price per ton for the applicable type of HMA placed (i.e. "HMA Cl. __ PG __").

9-36 RECYCLED ASPHALT SHINGLES (RAS) SPECIFICATIONS (NEW SECTION)**9-36.1 OVERVIEW**

For purposes of this *SE 416th Street Overlay: Shingles in Paving Demonstration*, this specification requires that the Contractor ensure that the Shingle Recycling Operator and the Recycling Facility:

- Secure a supply of tear-off asphalt shingle scrap and stockpile it, process/grind the scrap, test and stockpile the RAS product;
- Be compliant with their jurisdictions comprehensive solid waste management plan, and any additional local solid waste handling regulations or requirements. For firms in Washington State this includes Chapter 173-350 WAC Solid Waste Handling Standards;
- For firms in Washington State, be permitted as a solid waste handling facility or has properly notified both the Department of Ecology and local health department of the intent to operate under the exemption option;
- Have the necessary plans in place for protecting worker health/safety and the environment;
- Perform testing on the finished RAS product and provide verification that the RAS product does not include asbestos containing material (ACM) as per local, state and federal regulations;
- Meet RAS material quality standards specified herein prescribed to help ensure optimum performance when used in hot mix asphalt (HMA); and
- Meet other stockpiling, sampling and testing requirements specified herein.

Material quality specifications and Shingle Recycling Operator and Recycling Facility qualifications are described in greater detail in the remainder of this Section 9-36. The Contractor is ultimately responsible for seeing that these specifications and qualifications are met by the Shingle Recycling Operator and Recycling Facility. All documentation, testing results, reports, and notifications that are generated as part of this Contract are to be transmitted from the Shingle Recycling Operator and its Recycling Facilities to the Contractor, and the Contractor will provide those to the Contracting Agency.

9-36.2 MATERIAL QUALITY SPECIFICATIONS

The Shingle Recycling Operator and Recycling Facility must meet the following sourcing, inspecting, processing, sampling, testing, and stockpiling standards, including those meant to ensure that the project is free of ACM.

SE 416th Street Recycled Asphalt Shingle (RAS) Paving Demonstration

1. **Requirements for Type of Raw Materials:** Only tear-off asphalt shingles are to be used for the project. Other asphalt roofing products (e.g., built up roofing, rolled or sheet roofing, etc.) shall not be used in this demonstration project.
2. **Requirements for Separation of Raw Materials:** Minor incidental amounts of other roofing materials (e.g., wood, plastic, metal, etc.) are allowed in the incoming loads to the Shingle Recycling Operator, but separation of these materials prior to grinding may be needed for the final product to be within limits of the amount and size of extraneous waste materials allowed in the final RAS product.
3. **Asbestos Testing Requirements:** Each incoming load of tear-off asphalt shingles for the demonstration project must be inspected by an Asbestos Hazard Emergency Response Act (AHERA)-accredited inspector at the time of unloading at the Shingle Recycling Operator's Recycling Facility. If suspect ACM material is found in incoming loads, the load **shall** be rejected or tested for ACM. If material is determined to contain ACM, then the Shingle Recycling Operator must notify the Contractor and follow the rules of Puget Sound Clean Air Agency for handling asbestos and this material **shall not** be used in the demonstration project. The Contractor will notify the Contracting Agency under these circumstances.
4. **Sampling Requirements:** The finished RAS material to be incorporated into the HMA paving demonstration must be randomly sampled in accordance 9-36.4 RAS Sampling and Testing Requirements and tested to ensure that it is free of ACM according to procedures specified in these RAS Specifications.
5. **Gradation Requirements:** The final RAS product shall be processed so that 100 percent passes the 12.5-mm (1/2 inch) sieve and a minimum of 95 percent passes the 9.5-mm (3/8 inch) sieve when tested in accordance with the test method in Washington State Department of Transportation's (WSDOT) *Materials Manual* "FOP for WAQTC/AASHTO for Sieve Analysis of Fine and Coarse Aggregates." (See Appendix 3)
6. **Requirements Regarding Extraneous Waste Materials:** The final RAS product to be used in the HMA shall be substantially free of extraneous waste materials and entirely free of whole, intact nails. Lighter extraneous material such as paper, wood and plastic shall not exceed 1.5 percent by mass as determined on material retained on the 4.75-mm (No. 4) sieve. Total extraneous materials including metals, glass, rubber, nails, soil, brick, tars, paper, wood and plastic shall not exceed 3.0 percent by mass as determined on material retained on the 4.75-mm (No. 4) sieve. The method of sampling and testing shall be in accordance with "FOP for AASHTO Standard Practice for Sampling Aggregates" and "FOP for WAQTC/AASHTO Sieve Analysis of Fine and Coarse Aggregates." (See Appendix 3.)
7. **RAS Moisture Content:** The final RAS product to be used in the HMA shall not contain more than 5.0 percent moisture when tested in accordance with "FOP for AASHTO Total Evaporable Moisture Content of Aggregate by Drying." (See Appendix 3) The Shingle Recycling Operator shall take necessary steps to ensure excessive moisture is not retained in the RAS stockpiles.

9-36.3 SHINGLE RECYCLING OPERATOR AND RECYCLING FACILITY QUALIFICATIONS

In addition to producing a RAS product that meets the material quality specifications outlined above, the Shingle Recycling Operator shall certify that it and its Recycling Facility meet all relevant safety, health and environmental regulations and standards, including, but not limited to, the following requirements:

1. Be compliant with their jurisdiction's comprehensive solid waste management plan and any additional local solid waste handling regulations or requirements. For firms located in Washington State, this includes Chapter 173-350 WAC Solid Waste Handling Standards;

SE 416th Street Recycled Asphalt Shingle (RAS) Paving Demonstration

2. For firms located in Washington State, be permitted as a solid waste handling facility or has properly notified both the Department of Ecology and local health department of the intent to operate under the exemption option;
3. Have in place a workplace accident prevention program that addresses workplace hazards in accordance with local and state regulations. For firms located in Washington State, this includes WAC 296-800-140. The plan must address asbestos hazards; and
4. The Contractor must submit a form, completed and signed by the Shingle Recycling Operator, that certifies that the Shingle Recycling Operator and its Recycling Facility meet the above requirements and standards. (See Appendix 2 RAS Supply Verification Form.)

9-36.4 RAS SAMPLING AND TESTING REQUIREMENTS

The Shingle Recycling Operator shall collect and test samples of the finished RAS product to be utilized in the demonstration project. The Shingle Recycling Operator shall document sampling methods and maintain adequate records of all testing results. Copies of all test records shall be submitted to the Contracting Agency no later than the next business day after the test.

The Shingle Recycling Operator shall use standard procedures for RAS product sampling from the stockpile as per "FOP for AASHTO Standard Practice for Sampling Aggregates." (See Appendix 3) [Note: Alternative or additional sampling collection procedures may be proposed by the Shingle Recycling Operator subject to the prior approval by the Contracting Agency and KCSWD.]

9-36.4(A) ASBESTOS TESTING

The Contractor and Shingle Recycling Operator shall be responsible for providing the following:

1. Asbestos testing shall occur on the finished RAS product after grinding, screening or other finishing processes are complete. For purposes of asbestos testing, the Shingle Recycling Operator shall collect a random one (1) pound sample from the finished RAS product stockpile for every ten (10) tons of RAS produced.
2. Each of the one (1) pound samples shall be divided in half and each half clearly labeled (Example: "Sample #1A" and "Sample #1B", "Sample #2A" and "Sample #2B", etc.). The samples labeled with an "A" shall be transmitted to an accredited asbestos testing laboratory. The samples labeled with a "B" shall be retained, stored for 90 days, and made available to the Contracting Agency upon request.
3. The samples send to the accredited asbestos testing laboratory shall be analyzed by polarized light microscopy as specified in EPA regulations 40 CFR Part 763, Subpart E by an accredited independent laboratory.
4. The Shingle Recycling Operator shall provide the Contractor copies of all original asbestos laboratory reports for submittal to the Contracting Agency.
5. The Shingle Recycling Operator shall allow the Contracting Agency, KCSWD and WSDOT safe access to its Recycling Facility to observe the shingles recycling operations.
6. The Shingle Recycling Operator shall allow the Contracting Agency, KCSWD and WSDOT to arrange and provide safe access to the stockpile for a separate collection of samples directly from the finished RAS product pile upon request.

SECTION 02743

HOT MIX ASPHALT (HMA) PAVING

PART 1 GENERAL

1.01 SUMMARY

- A. This Section specifies Hot Mix Asphalt (HMA) and the use of Recycled Asphalt Shingles (RAS) in HMA for paving maintenance, repair and improvement.
- B. Related Sections:
 - 1. Section 01010 – Summary of Work
 - 2. Section 02300 - Earthwork

1.02 REFERENCES

- A. This Section incorporates by reference the latest revisions of the following documents. They are a part of this Section as specified and modified. In case of conflict between the requirements of this Section and those of the listed documents, the requirements of this Section shall prevail.

<u>Reference</u>	<u>Title</u>
AASHTO M17	Mineral Filler for Bituminous Paving Mixtures
AASHTO T 209	Standard Method of Test for Theoretical Maximum Specific Gravity and Density of Hot-Mix Asphalt Paving Mixtures
ASMA	Asphalt Sealcoat Manufacturers Association
ASTM C131	Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
ASTM C719	Standard Test Method for Adhesion and Cohesion of Elastomeric Joint Sealants Under Cyclic Movement (Hockman Cycle)
ASTM D412	Standard Test Methods for Vulcanized Rubber and Thermoplastic Rubbers and Thermoplastic Elastomers-Tension
ASTM D994	Standard Specification for Preformed Expansion Joint Filler for Concrete (Bituminous Type)
ASTM D2419	Standard Test Method for Sand Equivalent Value of Soils and Fine Aggregate
ISSA A105	International Slurry Surfacing Association – Recommended Performance Guidelines A105 for Emulsified Asphalt Slurry Seal
ISSA T100	International Slurry Surfacing Association – Test Method Number T-100 for Wet Track Abrasion of Slurry Seals
KING COUNTY	2010 Recycle Asphalt Shingles (RAS) Specification and Guidelines
SHRP-H-348	Asphalt Pavement Repair Manuals of Practice – Strategic Highway Research Program, National Research Council

1.03 DEFINITIONS AND ACRONYMS

- A. Compaction: The degree of compaction is specified as percent compaction. Maximum or relative densities refer to dry soil densities obtainable at optimum moisture content.
- B. CSBC: Crushed surfacing base course
- C. CSTC: Crushed surfacing top course
- D. HMA: Hot mix asphalt
- E. JMF: Job mix formula
- F. RAP: Recycled Asphalt Pavement
- G. RAS: Recycled Asphalt Shingles – The finished product derived from crushing, grinding, screening and otherwise processing tear-off asphalt shingles into a form ready for use in hot-mix asphalts plants.
- H. Required Excavation: The minimum excavation necessary to execute the work in full compliance with the contract.

1.04 GENERAL REQUIREMENTS

- A. RAS
 1. Contractor shall ensure that the Shingle Recycling Operator and the Recycling Facility meet the requirements and standards of the 2010 RAS Specification Guidelines.
 - a. The 2010 RAS Specification Guidelines have been attached to the end of this Section.

1.05 SUBMITTALS

- A. Submit the following upon issuance of Notice to Proceed and Prior to commencing work issued under this Contract:
 1. Complete test results and details on the proposed HMA mixes.
 2. Complete data to substantiate the specified qualifications of proposed asphalt mixing plants.
 3. Technical data on asphalt materials to be used for tack coats and paving mixes.
 4. Technical data on materials to be used for crack sealing. Include detailed description of the equipment to be used for product application and information on the qualifications of the personnel applying the materials, as necessary to demonstrate compliance with the requirements imposed by the vendor to guarantee product performance.
 5. Technical data on materials to be used for seal coating. Include manufacturer's mix certification; detailed description of the equipment to be used for product application; and information on the qualifications of the personnel applying the materials, as necessary to demonstrate compliance with the requirements imposed by the vendor to guarantee product performance.

6. Technical data on rubberized asphalt.
 7. Technical data on soil residual herbicide.
 8. Methods and procedures for constructing new asphalt pavement sections and overlays. Include complete details on temperature ranges to be maintained during mix placement and compaction in order to achieve the specified in-place densities.
 9. Methods and procedures for planning existing asphalt concrete surfaces.
 10. Provide Project Representative list of all suppliers on all materials to be used under this Contract and unless the Contractor will use multiple suppliers and varying materials for individual Work Orders, the County will file this information with the understanding that such information relates to all issued Work Orders. If not, the County expects submittals stating such on affected Work Orders.
- B. Submit the following together with submittals in accordance with Section 01010 1.03 – Work Order Procedures – Non-Emergency for all Work Order Requests before a Work Order directing Contractor to perform work will be issued.
1. RAS product test results as specified in section 3.4 of the 2010 RAS Specification Guidelines.
 2. RAS documentation, testing results, reports, and notifications that are generated to verify RAS is free of asbestos containing material (ACM) as specified in Section 3.2 of the 2010 RAS Specification Guidelines.
 - a. Asbestos survey documentation for each incoming load of roofing material used to produce RAS product.
 - b. Load Inspection Forms (Appendix G of 2010 RAS Specification Guidelines) filled out by an Asbestos Hazard Emergency Response Act (AHERA) accredited staff.
 - c. For any and all non-documented loads in reference to 2a. above, independent accredited asbestos testing laboratory (IAATL) original lab data reports for each load tested, including methodology used to sample test for asbestos content.
 - d. Notification, if potential ACM has been identified.
- C. Submit fully executed Submittal Checklist (Form 02743-A, included in the Appendix to this Section) and with every Work Order Invoice for asphalt pavement materials. The Submittal Checklist shall be signed and initialed, where appropriate, by the supplier of pavement products. Submittals will not be complete without a fully executed checklist.
- D. Truck load tickets issued by mixing plant shall be submitted to Project Representative.

1.06 QUALITY ASSURANCE SUBMITTALS

- A. Material checklists signed by material producer certifying that each material complies with specified requirement.
- B. Mix design verification by WSDOT.

- C. Paving Contractor:
1. HMA plant control process plan for incorporation of recycled asphalt pavement (RAP) and recycled asphalt shingles (RAS) into HMA paving.
 2. A list of key paving personnel and their applicable work experience.
 3. Signed Shingle Recycling Operator Form (Appendix C - 2010 RAS Specification Guidelines).
 4. Shingle Recycling Operator and its Recycling Facilities Solid Waste Handling Facility Permit or documented exemption.
 5. Workplace Accident Plan in accordance with Section 01063 – Contractor Safety and Health Requirement.

1.07 QUALITY ASSURANCE AND CONTROL

- A. General: The Specifications and Drawings show the minimum requirements that the quality of materials, workmanship, and final hot mix asphalt pavement products must meet. It is imperative that the Contractor understands that there shall be no tolerance for deviations from the specified minimum thickness of courses, ranges of in-place air voids, slopes and surface smoothness.
- B. Basis for Determining Quality: Hot mix asphalt pavement work shall conform to the requirements provided in this Section.
- C. Asphalt Mix not Meeting Specified Delivery Temperature: Mix exceeding 325^o F (260^o F for Class D) at the point of discharge for placement may be rejected by the Project Representative. A rejected mix shall be replaced by the Contractor with a mix that meets the Specifications and at no cost to King County.
- D. Pavement not Meeting Specifications: Pavement that does not fully meet the requirements of the Contract Document, said pavement will be deemed defective and the Project Representative, at the Project Representative's sole discretion, will select one of the following options:
1. Have the Contractor remove the defective pavement and replace it with new pavement acceptable to the Project Representative, at no cost to King County.
 2. Allow the defective pavement to remain in place and deduct from the amount of the Contract a value equal 95% of the cost of the volume of hot mix asphalt and base material in the defective pavement. The Project Representative will determine the unit price of the material, FOB work site, based on the price for the specified class of hot mix asphalt and base prevailing in the area of the work.
 3. Allow the defective pavement to remain if, in the opinion of the Project Representative, the defects are related to surface smoothness or minor deviations from the specified slopes. This provided that the Contractor repair the defects in conformance to the requirements in Paragraph 3.16 of this Section, to the satisfaction of the Project Representative, and at no cost to King County. The Project Representative will not exercise this option when pavement defects are related to in-place air voids, or thickness of pavement courses.

- E. Shingle Recycling Operator and Recycling Facility shall meet the requirement and standards of the 2010 RAS Specification Guidelines.
- F. RAS Quality Control and Verification Testing:
 - 1. Quality control and verification testing shall be conducted in accordance with the requirements and standards of the 2010 RAS Specification Guidelines.

PART 2 PRODUCTS

2.01 BASE MATERIAL

- A. Crushed Surfacing: Shall be CSTC or CSBC as directed by the Project Representative. Crushed surfacing shall meet the requirements of Section 9-03.9(3) of the WSDOT Standard Specifications.
- B. The Contractor should expect that work issued under this contract will (in most cases) involve little or no base material placement. Where in the case such as the replacement/resurfacing of existing asphalt exposes deficient sub-base or sub-grade, the Contractor shall contact the Project Representative for direction before paving.
- C. The Contractor should expect that work issued under this contract will primarily be for existing asphalt work and as such the Project Representative cannot offer exact depths, lifts, dimensions of asphalt or existing sub-base or sub-grade materials as this information will differ from one site to another and from one area on a site to another.

2.02 ASPHALT EMULSION

- A. Asphalt for tack coats and treatment of aggregate base shall be CSS-1 or CSS1h.

2.03 HOT MIX ASPHALT

- A. Aggregate: Shall be of the type, size, grading and proportioning equal to or better than the existing – as specified in the Plans and in Section 9-03.8(1) of the WSDOT Standard Specifications.
- B. Asphalt binder: The grade of the asphalt binder, unless otherwise specified in the Plans, shall be PG 64-22.
- C. Recycled Material:
 - 1. The Contractor shall utilize recycled asphalt pavement (RAP) and recycled asphalt shingles (RAS) in the production of HMA.
 - a. The maximum recycled asphalt pavement (RAP) content shall be 15 percent (plus or minus one-half of one percent) of the total aggregate weight of the aggregate in the mix.
 - b. The use of recycled asphalt shingles (RAS) material in the mixes shall be 3 percent (plus or minus one-half of one percent) of the total weight of the aggregate mix. The RAS material shall comply

with the requirements and standards of the 2010 RAS Specification Guidelines.

- c. Changes to the aggregate, asphalt binder, RAS or RAP require approval of the Engineer and may require a new mix design submittal from the Contractor.

2.04 JOINT AND CRACK SEALANT MATERIALS

- A. Joint Filler: Shall be pre-molded, composed of asphalt fiber and mineral filler with asphalt impregnated liners on both sides, and shall conform to ASTM D994.
- B. Rubberized, hot poured sealants shall meet the requirements of AASHTO M 173 Concrete Joint Sealer, Hot Poured Elastic Type and be sampled in accordance ASTM D 5197.
- C. Sand slurry for crack sealing shall consist of approximately 20 percent CSS-1 emulsified asphalt, approximately 2 percent Portland cement, water (if required), and the remainder clean 1/4 inch-0 paving sand.

2.05 CURBING

- A. Curbing shall be of the type shown on the Drawings.
 - 1. Substituting Portland cement concrete material with hot mix asphalt shall not be allowed, unless specifically shown otherwise on the drawings.
 - 2. Substituting steel tie bars for the anchoring of extruded Portland cement concrete curbing with adhesive shall not be allowed, unless specifically shown otherwise on the drawings.

2.06 SEAL COATING MATERIAL

- A. Seal coating material shall be a mineral-reinforced, reactive polymerized, bituminous emulsion, such as Special Asphalt Products' Resurfacer XLR8, or Project Representative-approved equivalent presenting characteristics equal or better than the following:
 - 1. General:
 - a. Materials shall meet the requirements of ASMA specification section 1-3.02
 - b. Performance shall conform to the requirements of ISSA A105
 - 2. Solids content (no fibers): 70% or higher.
 - 3. Density: 11 lbs./gal. minimum.
 - 4. Coverage rate: suitable for one-coat application with minimum coverage rates of 25 to 45 square feet per gallon of undiluted material.
 - 5. Curing rate:
 - a. ready for vehicle traffic within no more than 2-1/5 hours when applied at ambient conditions of 70% humidity and 55° to 60°F.
 - b. ready for vehicle traffic within no more than 1 hour when applied at ambient temperatures of 75° to 85°F.

PART 3 EXECUTION

3.01 PREPARATION OF EXISTING SURFACES

- A. As a minimum, comply with the preparation and application requirements specified by the product manufacturer to guarantee product performance.
- B. Air compressors and other related equipment used for the preparation of cracks to receive crack-sealing compounds shall be capable of delivering air blast at a minimum rate of 100 lb/in² with a flow of 150 cfm and equipped with oil/moisture-filtering systems.
- C. Perform crack cleaning and drying using hot compressed air lance equipment capable of producing a minimum 2,000 fps blast velocity of air at 2,500 °F minimum temperature. The equipment shall be operated only by experienced personnel who shall exercise extreme caution to avoid burning the hot mix asphalt. Equipment using direct-flame torches shall not be allowed.
- D. Cut cracks ¼-inch and up to ¾-inch in width using router-bits of the type recommended by the crack sealant manufacturer. Cut to the depths and widths recommended by the crack sealant manufacturer.
- E. Constantly monitor and maintain the application and safe-heating temperatures while preparing hot-applied materials. Do not heat and reheat materials, or use prolonged heating periods beyond the manufacturer's recommendations. Do not use, or remove and replace materials found by the Project Representative not to be in compliance with these requirements. Have at all times the hot-applied material manufacturer's recommendations for application and safe-heating temperatures, and maximum prolonged heating periods displayed in a manner easily visible to the Project Representative.

3.02 PREPARATION

- A. Prior to paving, proof roll all exposed sub-base or sub-grade surfaces to confirm the sub-grade is firm and unyielding. If directed by the Project Representative, compact the exposed surface to a minimum of 95 percent of the maximum dry density as determined by the compaction control tests described in Section 2-03.3(14)D of the WSDOT Standard Specifications.
- B. Do not begin paving until deficient sub-base or sub-grade areas have been corrected and are ready to receive paving.
- C. Tack Coat: Apply to contact surfaces of existing or in-place asphalt and surfaces abutting or projecting into HMA Pavement.
 - 1. Allow to dry until at proper condition to receive paving.
- D. Exercise care in applying bituminous materials to avoid over spray and smearing of adjoining surfaces. Clean damage surfaces.

3.03 ASPHALT TREATED BASE PLACEMENT

A. Asphalt Treated Base:

1. Compaction shall be to a minimum of 85% of the maximum theoretical density.
2. The roadway surface temperature at the time of placement shall be maintained to a minimum of 60°F.
3. The minimum temperature at which the specified level of compaction of the asphalt treated base shall be achieved is 185°F. Material not meeting the specified level of compaction before its temperature drops to 185°F shall be removed and replaced with new material achieving the specified compaction within the specified temperature limits and at no cost to King County.

3.04 HMA INSTALLATION

A. General Requirements:

1. Construction shall conform to the details, dimensions and grades specified and shown on the Plans. Maximum variations in finished grade of paving shall be ± 0.05 feet, except that variations which in the judgment of the Project Representative could cause ponding of runoff shall not be allowed.
 - a. Asphalt mixing plants supplying product for Work Orders issued under this Contract shall be those having established accurate quality control procedures that ensure the production of mixes meeting the specifications called out in the sections throughout this specification and the 2010 RAS Specification Guidelines.

B. Mix Design:

1. Prior to production of HMA, the Contractor shall determine a design aggregate structure and asphalt binder content including RAP and RAS in accordance with this Section.
2. The Contractor mix design shall include 3% RAS and 15% RAP.
 - a. The total asphalt binder contribution from the RAP and RAS shall not exceed 30 percent by mass of the total binder.
 - b. If a reduction of RAP, or RAS, is required to remain within the 30 percent requirement, RAP shall be reduced in consultation with the Project Representative.

3.05 HOT MIX ASPHALT PAVEMENT SPREADING AND FINISHING

A. Spreading and finishing:

1. The roadway surface temperature at the time of spreading shall be maintained to a minimum of 60°F.
2. The temperature of the mix shall be such that compaction work can be performed while the mix temperature is between a minimum of 185°F and a maximum of 300°F.

3.07 HOT MIX ASPHALT PAVEMENT COMPACTION

- A. Asphalt pavement having a specified compacted course thickness greater than 0.10 foot shall be thoroughly and uniformly compacted to a minimum of 92 percent of the maximum theoretical density as determined by AASHTO Test method T-209. Asphalt pavement not meeting this requirement shall be removed and replaced by the Contractor at no additional cost to the County.
- B. It shall be the Contractor's responsibility to monitor temperatures, asphalt concrete placing procedures and compacting procedures to obtain the required percentage range of laboratory density.
 - 1. The required level of compaction must be achieved while the mix temperature is between a minimum of 185°F and a maximum of 300°F.
 - 2. Material not meeting the specified level of compaction before its temperature drops to 185°F shall be removed and replaced with new material achieving the specified compaction within the specified temperature limits and at no cost to King County.

3.08 ASPHALT SEALCOATING

- A. When sealcoating is called for on the Drawings, apply the sealcoat mix by mechanical means, using equipment and techniques in strict conformance with the recommendations from the sealcoat material manufacturer.
- B. The asphalt sealcoat being applied shall be uniform, free flowing and free of lumps and other inconsistencies. Dilute the mix only under the circumstances recommended by the mix manufacturer. Dilute in strict conformance with the manufacturer's recommendations. Do not exceed 5 percent dilution by volume. Obtain approval from the Project Representative prior to applying a diluted sealcoat mix.
- C. The asphalt sealcoat shall consist of one application of the sealcoating mix at the highest application rate recommended by the mix manufacturer.
- D. Maintain the documentation containing the mix manufacturer's recommendation available at the site for review by the Project Representative at all times during application of the sealcoat.
- E. After sealcoating, the finished surface shall be uniform and without ridges or untreated areas. Areas not meeting this requirement will be rejected and shall be re-worked, at Contractor's expense and to the satisfaction of the Project Representative.

3.09 SURFACE SMOOTHNESS

- A. Surface smoothness: The completed surface of all courses shall be of uniform texture, smooth, uniform as to crown and grade, and free from defects of all kinds. At the Project Representative's discretion, the Contractor will either remove and replace, or repair, at no cost to King County, pavement presenting any of the following surface conditions:
 - 1. Transverse ripples.

2. Surface airline cracks, particularly cracks resulting from heat checking.
3. Bumps at transverse joints.
4. Mat separation at longitudinal joints.

3.10 WEATHER LIMITATIONS

- A. The Contractor shall pay special attention to weather conditions and temperatures in order to properly schedule any compaction and asphalt placement activities.

3.11 ACCEPTANCE, SAMPLING AND TESTING

- A. Contractor's Responsibilities:
 1. The primary responsibility for monitoring compliance with the requirements of the Contract Document shall be the Contractor's. The time frame under which the Project Representative brings up to the Contractor's attention the need for correcting unacceptable work or products shall not constitute cause for the Contractor to claim additional payment or right to damages. This providing that the Project Representative communicates the need for corrective action within a time frame that is consistent with the prevailing time to obtain test results from qualified testing institutions in the general area of work.
- B. Sampling: The Contractor shall provide full cooperation and facilitate sampling by the County. The Project Representative reserves the right to have samples cut or cored from the completed pavement or the individual courses. Additionally, the Project Representative may take samples of the uncompressed HMA mixtures as well as all materials incorporated in the work. Where samples have been taken from the uncompressed HMA, new material shall be placed and compacted to conform with the surrounding area at no additional expense to the County.
- C. Acceptance: Shall be as provided under requirements in Volume 1 where Contract Specifications prevail.
- D. Testing: Shall be as provided according to methods and other requirements in Volume 1 where Contract Specifications prevail.

3.12 PAVEMENT REPAIRS

- A. If the Project Representative determines that it is in King County's best interest to allow the Contractor to repair surface smoothness related pavement defects rather than having the pavement removed and replaced, the repair work shall be as follows:
 1. In general, repairs shall be as directed by the Project Representative, who will select the appropriate methods from SHRP-H-345.
 2. The repair method for surface cracks 1/16-inch or wider shall be the construction of a Typical Asphalt Pavement Joint as shown on the Drawings and following the preparation procedures in SHRP-H-345.

3.13 PAVEMENT PROTECTION

- A. Do not permit vehicular traffic on newly constructed pavement until it has cooled and hardened.
- B. Provide barricades and warning devices as required.

END OF SECTION