

**2010 Recycled Asphalt Shingles (RAS) Specification
Guidelines**

**For Contracting Agencies specifying RAS to be used
in Hot Mix Asphalt**

DISCLAIMER

King County developed the 2010 Recycled Asphalt Shingles (RAS) Specification Guidelines by revising the 2009 RAS Specification used in King County's 2009 Shingles in Paving Demonstration to test the use of RAS in hot mix asphalt (HMA) on a public road. The 2010 RAS Specification Guidelines reflects key lessons learned about RAS quality assurance and quality control from the Paving Demonstration and provides the next best iteration of guidelines and procedures for producing RAS for HMA paving applications. The intent of the 2010 RAS Specification Guidelines is to provide guidance, based on the consensus of key stakeholders, about how a Contracting Agency may wish to proceed with the use of RAS in HMA paving applications.

The 2010 RAS Specification Guidelines is not intended to serve as a final materials standard for King County or any other jurisdiction. While the 2010 Specification Guidelines was reviewed by the stakeholders highlighted in Appendix A, it has not undergone an official or provisional materials specification development process. King County accepts no responsibility or liability for actual use of RAS in a paving project regardless of the use of this document.

Contracting Agencies are encouraged to utilize the resources identified in this document and on the following websites for additional guidance:

King County LinkUp's Shingles in Paving Project:

<http://your.kingcounty.gov/solidwaste/linkup/shingles/resources.asp>

Construction Materials Recycling Association's shingles recycling online resource:

<http://www.shinglerecycling.org/>

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1. INTRODUCTION

The 2010 Recycled Asphalt Shingles (RAS) Specification Guidelines is for general dissemination and use to guide the production of RAS for its use in hot mix asphalt (HMA) paving applications.

1.1 DEFINITIONS

For the purposes of this Specification, the following definitions apply:

Asbestos containing material (ACM): Any material containing more than 1 percent asbestos as defined by WAC 296-62-07703 and U.S. EPA's National Emissions Standards for Hazardous Air Pollutants (NESHAP) rules (CFR Part 61, Subpart M).

ACM - Potential: Any roofing material or other building products that the building owner, roofing contractor, Shingle Recycling Operator, agent of the Contracting Agency, or regulatory agency deems may be a candidate for ACM based on informed and reasonable visual inspection. Potential ACM includes Suspect ACM materials as defined by various regulatory agencies but may also include additional materials not highlighted on Suspect lists such as coatings and mastics used on asphalt shingles (e.g., aluminum coatings, plastic roofing cement, other patching materials, etc.).

ACM - Suspect: Term used by the regulatory community for material that is known to have historically contained asbestos including, but not limited to, fireproofing materials, ACM thermal insulation, built-up roofing, slate or cement shingles and siding, fire barriers, gaskets, asphalt flooring, other flooring mastic material, and vinyl floor tile.

Asbestos Hazard Emergency Response Act (AHERA)-accredited building inspector: A person who has successfully completed the training requirements for a building inspector established by EPA Asbestos Model Accreditation Plan; Interim Final Rule (40 CFR Part 763, Appendix C) and whose accreditation is current.

Asbestos survey: An inspection by a competent person to assess the potential for ACM. According to local asbestos regulations – WAC 296-62-07721(2)(b)(ii) and Puget Sound Clean Air Agency Regulation III, Article 4.02(a) – an asbestos survey is required prior to a renovation of a building to determine whether materials or structures to be worked on, renovated, removed, or demolished contain asbestos. Depending on the building type and ownership structure, an Asbestos Hazard Emergency Response Act (AHERA)-accredited building inspector may be required to conduct the survey and complete a written report. This survey is sometimes referred to as a “Good Faith Inspection”.

Asbestos survey documentation: A signed, written report describing an asbestos survey.

Clean Air Authority: Agency responsible for air quality in a defined region. For example, in Washington State, the Puget Sound Clean Air Agency has authority in Snohomish, King, Kitsap and Pierce Counties.

Contracting Agency: Agency of Government that is responsible for the execution and administration of the contract.

Engineer: The Contracting Agency's representative who administers the construction program for the Contracting Agency.

Hot mix asphalt (HMA): Mixture of aggregate and liquid asphalt heated in a mixing plant and transported and installed on a road surface before cooling.

Hot mix asphalt producer: Company that manufactures HMA from aggregates and asphaltic materials.

Independent accredited asbestos testing laboratory (IAATL): Testing laboratory with proficiency demonstrated by current successful participation in a nationally recognized testing program such as the National Voluntary Laboratory Accreditation Program (NVLAP) of the National Institute for Standards and Technology (NIST) or the Round Robin for bulk samples administered by the American Industrial Hygiene Associate (AIHA), or an equivalent nationally recognized Round Robin testing program.

Mixed roofing material (MRM) or mixed roofing loads: Loads of roofing debris that include a mixture of tear-off shingles and other roofing materials, such as wood, metal, tar paper/roofing felt, and mastic.

Recycled asphalt shingles (RAS): The final product derived from crushing, grinding, screening and otherwise processing tear-off asphalt shingles. RAS is most often processed into a form ready for use in HMA.

Roofing material - documented (or documented roofing material): Roofing material received by the Shingle Recycling Operator that is accompanied by asbestos survey documentation as per local, state, and federal regulations.

Roofing material - non-documented (or non-documented roofing material): Roofing material received by the Shingle Recycling Operator that is not accompanied by asbestos survey documentation. This may include (but is not be limited to) roofing material from owner occupied, single family homes.

Shingle Recycling Facility: The physical plant (or plants) where tear-off asphalt shingles are received, processed into a final RAS product, tested and stockpiled. This may include separate transfer locations. Sometimes referred to as "Recycling Facility".

Shingle Recycling Operator: The company, or companies, that receive tear-off asphalt shingles and transform it into a final RAS product for use in HMA.

Tear-off asphalt shingles: Previously used asphalt shingles derived primarily from re-roofing projects whereby the old shingle layers are removed to prepare the roof surface for new shingles and/or other roofing materials. Sometimes referred to as “tear-off asphalt shingles scrap”.

Whole shingles: Shingles that have been inspected and sorted, but have not yet been ground into RAS for use in a new material or product, such as HMA.

1.2 BACKGROUND

King County developed the 2010 RAS Specification Guidelines by revising a 2009 RAS Specification used in King County’s 2009 Shingles in Paving Demonstration to test the use of RAS in HMA on a public road. The 2009 Paving Demonstration was an initiative of LinkUp, a program of the King County Solid Waste Division (KCSWD) in Washington State, in partnership with King County Department of Transportation Road Services Division (KCRSD) and the Washington State Department of Transportation (WSDOT). The 2009 Paving Demonstration was planned, designed, and implemented as a controlled experimental research study to evaluate the performance of RAS in HMA and foster the development of a local paving end market for tear-off asphalt shingles. For additional information about King County’s Paving Demonstration, please see the following resources:

- Paving Demonstration website:
<http://your.kingcounty.gov/solidwaste/linkup/shingles/paving-demo.asp>
- Paving Demonstration Final Report:
<http://your.kingcounty.gov/solidwaste/linkup/documents/shingles-paving-final-report.pdf>
- Paving Demonstration Final Report Appendices:
<http://your.kingcounty.gov/solidwaste/linkup/documents/shingles-paving-final-appendices.pdf>

The 2010 RAS Specification Guidelines reflects key lessons learned about RAS quality assurance and quality control from the Paving Demonstration and provides the next best iteration of guidelines and procedures for producing RAS for HMA applications. A draft version of the 2010 RAS Specification Guidelines was shared for comment with key stakeholders highlighted in Appendix A.

1.3 INTENDED USE OF THE 2010 RAS SPECIFICATION GUIDELINES

The intent of the 2010 RAS Specification Guidelines is to provide guidance, based on previous experience and consensus of key stakeholders in King County and Washington State, on how a Contracting Agency may wish to proceed with a paving project using RAS in HMA. As described in the Disclaimer, the 2010 Specification was reviewed by the stakeholders highlighted in Appendix A, but has not undergone an official or provisional materials specification development process. King County accepts no responsibility or liability for actual use of RAS in a paving project regardless of the

use of this document. Local Contracting Agencies may wish to modify the 2010 RAS Specification Guidelines to more adequately address their specific needs.

2. RAS SPECIFICATION GUIDELINES OVERVIEW

The 2010 RAS Specification Guidelines provides material quality and Shingle Recycling Operator and Recycling Facility requirements for inspecting, sorting, sampling, testing, stockpiling, and processing tear-off asphalt shingles. It also outlines material engineering standards for producing RAS for HMA as well as sampling, testing, and storage requirements for the RAS product.

2.1 SCOPE OF THE 2010 RAS SPECIFICATION GUIDELINES

The 2010 RAS Specification Guidelines outlines requirements for the Shingle Recycling Operator and the Recycling Facility at the point where incoming loads of roofing material arrive at the Recycling Facility and through the production and stockpiling of the final RAS product for use in HMA. This includes, but is not limited to, inspections of incoming loads; acceptance of asbestos assessment documents (if applicable); sampling and testing of whole shingles; sorting and processing clean whole shingles; and sampling, testing, and stockpiling of the final RAS product. The 2010 RAS Specification Guidelines identifies key requirements for handling, storage, and processing of tear-off asphalt shingles as they relate to worker health and safety and environmental regulations but may not be fully inclusive of all legal requirements. Therefore, it is up to each Shingle Recycling Operator to be aware of and follow any and all regulatory requirements that may not be covered in these Specification Guidelines.

2.2 SUMMARY OF REQUIREMENTS

The 2010 RAS Specification Guidelines requires that the Shingle Recycling Operator and its Shingle Recycling Facility meet the following requirements and standards:

- Secure a supply of tear-off asphalt shingles. Receive and visually inspect loads of acceptable roofing material and submit documentation that asbestos surveys and/or incoming load inspections were completed by trained persons or staff. For non-documented roofing material, select and quarantine one load every 50 tons for asbestos testing. Sort non-shingle debris from whole shingles. Then process (e.g., grind and screen) the clean, whole shingles. Once a final RAS product is produced, sample, test, and stockpile the RAS product until such time it is accepted by the Contracting Agency for use in HMA.
- Provide verification that the stockpile of whole shingles does not include ACM as per local, state, and federal regulations.
- Meet RAS material quality standards as specified to help ensure optimum performance when used in HMA.
- Comply with jurisdictional comprehensive solid waste management plans, 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. Firms in Washington State must either be permitted as a solid waste handling facility or have

properly notified both the Washington State Department of Ecology and local health department of the intent to operate under the exemption option.

- Have the required plans in place for protecting worker health and safety and the environment as required by OSHA Safety and Health Regulations for Construction, EPA NESHAP regulations, and agencies such as the Washington State Department of Labor & Industries, the Clean Air Authority, and local health departments.
- Provide the Contracting Agency safe access to the Recycling Facility to observe the shingle recycling operations and collect samples as deemed necessary by the Contracting Agency.

The material quality and Shingle Recycling Operator and Recycling Facility requirements are described in greater detail in the remainder of the 2010 RAS Specification Guidelines.

3. MATERIAL QUALITY REQUIREMENTS

The material quality requirements are designed to ensure that the RAS product can be successfully incorporated into HMA. To this end, the Shingle Recycling Operator and Recycling Facility must meet the following standards, including those meant to ensure that the RAS is free of ACM.

3.1 ASPHALT SHINGLE SUPPLY

Only asphalt shingles are acceptable for producing the RAS product. Other asphalt roofing products (e.g., built-up roofing, rolled or sheet roofing, etc.) are not permissible.

3.1.1 Requirements for Separation of Non-Shingle Debris

Only minor, incidental amounts of debris from other roofing materials are allowed in the incoming loads to the Shingle Recycling Operator. Manual separation of non-shingle debris prior to grinding may be needed for the final RAS product to be in compliance with extraneous waste materials limits as defined in Section 3.3.2.

3.1.2 Roofing Felt Should Be Removed

Roofing contractors supplying to the Shingle Recycling Facility shall be strongly encouraged to make a good faith effort at separating shingles from roofing felt and delivering clean, asphalt shingles only for recycling. If shingles are received with roofing felt, the Shingle Recycling Operator shall make every reasonable effort to remove roofing felt from the shingles before grinding.

3.1.3 Requirements for Separation of Potential Asbestos Containing Material

Any material identified as potential ACM through visual inspection shall be removed from incoming loads. This material shall be presumed ACM and handled in accordance with local, state, and federal regulations unless tested by an independent accredited asbestos testing laboratory (IAATL) and found to be non-detect for ACM. See Section 3.2 for detailed procedures on inspecting, sorting, sampling, and testing incoming roofing loads for ACM.

3.2 ASBESTOS MANAGEMENT

Asbestos management of shingles and other roofing material is required to protect worker health and safety and ensure that the whole shingles and final RAS product are free of ACM. While the risk of finding asbestos in asphalt shingles is low, the Shingle Recycling Operator shall employ asbestos management practices to mitigate any asbestos risk. According to local asbestos regulations, an asbestos survey is required prior to a renovation of a building to determine if ACM is present. Depending on the building type and ownership structure, an Asbestos Hazard Emergency Response Act (AHERA)-accredited building inspector may be required to conduct the survey and complete a written report. This specification strongly encourages the Shingle Recycling Operator to request such written documentation for incoming loads of shingles. However, as such documentation may

not be provided, asbestos management measures and documentation are required at the Recycling Facility to ensure that the whole shingles and final RAS product are free of ACM. Asbestos management requirements are described in detail below.

3.2.1 Visual Inspection of Incoming Loads by AHERA-Accredited Building Inspector

Each incoming load of roofing material (documented or non-documented) shall be inspected by an AHERA-accredited building inspector at the time of unloading at the Shingle Recycling Operator's Recycling Facility. Proof of accreditation of staff or contractors utilized for this purpose shall be submitted to the Contracting Agency prior to grinding the clean whole shingles into the final RAS product. The AHERA-accredited building inspector shall complete a Load Inspection Form (Appendix G) for each incoming load and submit this documentation to the Contracting Agency to verify that no ACM was identified during the incoming load inspection at the Recycling Facility. If potential ACM is identified through visual inspection, the Shingle Recycling Operator must notify the Contracting Agency immediately and follow the procedures outlined in Sections 3.2.2 for handling loads with potential ACM. Non-shingle debris shall be sorted and removed prior to grinding whole shingles.

3.2.2 Requirements for Loads with Potential Asbestos Containing Material

If potential ACM material is identified in the load, the Shingle Recycling Operator shall either 1) reject the load and handle the material according to local, state, and federal regulations, or 2) employ aggressive sorting procedures with staff trained in accordance with local, state, and federal asbestos regulations to remove any and all potential ACM from the load. The resulting clean whole asphalt shingles must then be sampled and tested for ACM in accordance with the procedures outlined in Sections 3.2.4, 3.2.5, 3.2.6, and 3.2.7.

3.2.3 Requirements for Documented Roofing Material

The Shingle Recycling Operator shall encourage roofing contractors supplying shingles to submit proper asbestos survey documentation to verify that the incoming material is free of ACM. When roofing contractors or building owners provide such asbestos survey documentation, a legible copy of this documentation shall be submitted to the Contracting Agency to verify the load is free of ACM and that the survey was completed by trained persons or staff. All documented roofing material shall be inspected and documented using the Load Inspection Form (Appendix G) upon arrival at the Recycling Facility by an AHERA-accredited building inspector per 3.2.1. If visual inspections confirm the load is free of ACM, the load shall then be stockpiled until accepted by the Contracting Agency for processing into RAS. [Note: the Contracting Agency will work with the Shingle Recycling Operator to determine the most efficient process for approving documented roofing material loads.]

3.2.4 Sampling Requirements for Non-Documented Roofing Material

For all roofing material not accompanied by asbestos survey documentation, visual inspections in accordance with Section 3.2.1 shall be performed to confirm the load is free of ACM. The AHERA-accredited building inspector shall complete the Load Inspection Form (Appendix G) and submit a legible copy of this documentation to the Contracting Agency. In addition, one load for every 50 tons of incoming non-documented roofing material shall be selected and quarantined for asbestos sampling and testing. Non-shingle roofing material shall be sorted and removed prior to sampling. Within the selected load for testing, each type of whole asphalt shingles (and any attached backing) from each distinct roofing layer shall be sampled by an IAATL for ACM testing. Any potential ACM visually identified during sampling (shingle or non-shingle debris) shall also be sampled and tested for asbestos. The Contracting Agency shall approve, in advance, written sampling and testing instructions and documentation of the sampling and testing methods shall be included in the IAATL report.

3.2.5 Selected Loads Must Be Quarantined

The loads selected for sampling and testing shall be quarantined and kept isolated from other materials until asbestos test results indicate a non-detect for ACM and the Contracting Agency approves the material for processing and use in HMA.

3.2.6 Polarized Light Microscopy Asbestos Testing

The samples of whole shingles shall be analyzed for asbestos by polarized light microscopy (PLM) as specified in EPA regulations 40 CFR Part 763, Subpart E by an IAATL.

3.2.7 Submit IAATL Reports

The Shingle Recycling Operator shall provide original lab data reports of an IAATL for each load tested to the Contracting Agency.

3.2.8 Loads Containing Whole Shingles That Test Positive for Asbestos Containing Material Shall be Rejected

If ACM is confirmed through asbestos testing of any of the samples, the Contracting Agency must be notified immediately and the entire load shall be rejected and handled in accordance with local, state, and federal regulations at the Shingle Recycling Operator's expense.

3.2.9 Rights to Sample Any Asbestos Containing Material Loads

The Contracting Agency asserts the right to obtain samples from any ACM contaminated load (or loads with potential ACM as determined by the Shingle Recycling Operator) prior to removal and disposal.

3.3 SPECIFICATIONS FOR RAS

The Shingle Recycling Operator shall provide to the Contracting Agency test results to verify that the RAS product meets the following requirements.

3.3.1 Gradation

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 WSDOT FOP for WAQTC/AASHTO T 27/11. (See Appendix D.)

3.3.2 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 WSDOT FOP for AASHTO T 2 and FOP for WAQTC/AASHTO T 27/11. (See Appendix D.)

3.3.3 Moisture Content

The Shingle Recycling Operator shall take all necessary steps to ensure excessive moisture is not introduced or retained in the RAS stockpiles. Moisture levels considered excessive would be those that negatively impact specified HMA moisture limits.

3.4 SAMPLING AND TESTING OF RAS

The Shingle Recycling Operator shall collect and test samples of the RAS product to be utilized in the HMA to verify that the final RAS product meets the requirements outlined in Section 3.3 (above) and to determine the asphalt content of the RAS material. All field, laboratory, and material testing shall be performed in accordance with WSDOT, ASTM or AASHTO standard test procedures (as defined in Appendix D.) using qualified testing personnel and calibrated, verified equipment.

3.4.1 Random RAS Samples

The Shingle Recycling Operator shall collect random samples of the final RAS product (after grinding and other finishing processes are complete) per WSDOT "FOP for AASHTO T 2 Standard Practice for Sampling Aggregates." (See Appendix D.) The Shingle Recycling Operator shall provide the Contracting Agency with a written sampling plan for the RAS. At a minimum, the final RAS product shall be sampled according to the following schedule:

- Once per the first 50 tons of final RAS produced; and then
- Once per every 250 tons of final RAS produced thereafter.

The Shingle Recycling Operator may sample and test more frequently, but must provide all results of any and all tests performed to the Contracting Agency. Duplicate samples shall be retained for 90 days by the Shingle Recycling Operator. The Contracting Agency shall be permitted to observe sampling of the final RAS product at the Recycling Facility.

3.4.2 Minimum Weight

Each random sample of RAS shall be a minimum of 25 pounds.

3.4.3 RAS Testing

Quality control and verification testing shall be conducted on the RAS samples by an independent laboratory in accordance with the standard test procedures specified herein to verify that the final RAS product meets the material specifications and to determine the asphalt content of the RAS. The Shingle Recycling Operator shall submit original lab data and test results to the Contracting Agency to verify the following requirements.

3.4.3.1 Specifications for RAS – Gradation, Extraneous Waste Materials, Moisture Content

The RAS samples shall be tested for gradation, extraneous materials, and moisture content in accordance with the methods described in Section 3.3.

3.4.3.2 Asphalt Content

The Shingle Recycling Operator shall determine the asphalt content of the RAS in accordance with either or both of the following test methods:

- “WSDOT FOP for AASHTO T 308 Determining the Asphalt Binder Content of Hot Mix Asphalt (HMA) by the Ignition Method.” (See Appendix D.)
- AASHTO T – 164, “Quantified Extraction of Asphalt Binder for Hot Mix Asphalt”. (Also in ASTM D2172-05. “Standard Test Methods for Quantitative Extraction of Bitumen from Bituminous Paving Mixtures.” See <http://www.astm.org/Standards/D2172.htm> for ordering information.

The Shingle Recycling Operator shall provide original lab data reports that include a description of the method used to determine asphalt content of the RAS sample to the Contracting Agency.

3.4.4 Contracting Agency Retains All Rights for Additional Testing

The Contracting Agency reserves the right to secure additional samples from the Shingle Recycling Operator’s stockpiles for the project. The additional samples may be taken at the sole discretion of the Contracting Agency whenever deemed necessary to achieve the goals of the project. These samples shall be provided at no additional costs to the Contracting Agency. In addition, the Contracting Agency reserves the right to conduct testing in order to verify any and all of the independent test results conducted by the Shingle Recycling Operator.

3.4.5 Contracting Agency Determines which Test Results Shall Govern

In any circumstances where the Contracting Agency's results differ from that of the Shingle Recycling Operator's and a reconciliation of test results cannot be achieved by the Contracting Agency, the Contracting Agency shall determine which test results govern this Contract.

4. OPERATOR AND FACILITY REQUIREMENTS

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 requirements outlined below. The Shingle Recycling Operator shall submit all required documentation to the Contracting Agency, including but not limited to verification of AHERA-accredited staff or contractors, asbestos survey and/or load inspection documentation (Appendix G), sampling and testing instructions to the IAATL, all laboratory reports, and certification of adherence (Appendix C) to the standards established in the 2010 RAS Specification Guidelines.

4.1 COMPLIANCE WITH SOLID WASTE REGULATIONS

Currently in Washington State, whole shingles and RAS are both regulated solid wastes. The agencies that enforce these regulations within counties are the local health departments and the Washington State Department of Ecology. The Codes of the local solid waste management authority (e.g., county) contain the regulations that apply to solid waste management in the specific county where the shingles or RAS is recycled (processed) and stored. Given the solid waste status of whole shingles and RAS (in Washington State), the Shingle Recycling Operator must be permitted as a solid waste handling facility or have properly notified both the Department of Ecology and the local health department of the intent to operate under the exemption option. The Operator is required to reduce risk to human health and the environment by complying with the Washington state solid waste regulations WAC 173-350-040 Performance standards, which state that the owner or operator of all solid waste facilities, subject to these standards, shall:

- 1. Design, construct, operate, and close all facilities in a manner that does not pose a threat to human health or the environment.**
- 2. Comply with chapter 90.48 RCW, Water pollution control and implementing regulations, including chapter 173-200 WAC, Water quality standards for ground waters of the state of Washington.**
- 3. Conform to the approved local comprehensive solid waste management plan prepared in accordance with chapter 70.95 RCW, Solid waste management – Reduction and recycling, and/or the local hazardous waste management plan prepared in accordance with chapter 70.105 RCW, Hazardous waste management.**
- 4. Not cause any violation of emission standards or ambient air quality standards at the property boundary of any facility and comply with chapter 70.94 RCW, Washington Clean Air Act.**
- 5. Comply with all other applicable local, state, and federal laws and regulations.**

Though the Shingle Recycling Operator is solely responsible for complying with these performance standards (WAC 173-350-040), representatives of the Contracting Agency and the local health

department will be available, including for site visits, to provide information and suggestions on how the Shingle Recycling Operator can achieve compliance. An initial site visit will be offered to the Shingle Recycling Operator to assess the site and discuss RAS material storage methods/practices for successful compliance with the state performance standards. The Shingle Recycling Operator may elect to use the methods/practices listed below or other methods/practices at their discretion, as long as it is in compliance with the referenced solid waste regulations. The primary environmental exposures that are of concern are to ground and surface water, and air quality.

- 1. To eliminate stormwater run-on and run-off, the RAS pile may be stored 1) inside a building, 2) on a concrete pad that drains to the sewer, 3) under a tarp in an area where surface water cannot flow through the base of the pile, or 4) in some other manner that is protective of ground and surface water standards.**
- 2. To eliminate fugitive dust, the RAS pile may be 1) covered with a tarp, or 2) use some other approved method that is protective of air quality standards.**

If deemed necessary, the Shingle Recycling Operator shall permit access by the local health department representative and the representative of the Washington State Department of Ecology to inspect the whole shingle and/or final RAS product piles for the purpose of determining compliance with WAC 173-350-040 Performance standards. Inspections may be conducted by the local health department at random times at a minimum of once every month during the time the whole shingles and/or final RAS product are at the Shingle Recycling Facility. It is not anticipated that more frequent inspections will be conducted unless the WAC 173-350-040 Performance standards are not being met. The goal of inspections is to assist the Shingle Recycling Operator in meeting these standards.

4.2 ACCIDENT PREVENTION PROGRAM REQUIREMENT

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 Accident Prevention Program. The plan must address asbestos hazards.

4.3 RAS OPERATIONS PROCESS REPORT AND/OR FACILITY SITE VISIT [OPTIONAL]

The Shingle Recycling Operator shall provide a detailed Process Report and any supplemental materials such as diagrams or photographs, describing the equipment and methods used to process RAS for use in HMA. The Process Report must include the following elements:

1. Source of tear-off asphalt shingles to be used (e.g., roofing contractors, haulers).
2. Detailed description of how documented and non-documented loads will be inspected and stockpiled separately in accordance with asbestos testing requirements.

3. Detailed description of how the non-shingle debris will be sorted and removed to ensure it is not incorporated in the RAS at a rate that exceeds the limits for extraneous waste materials as specified in Section 3.3.
4. Identification of the equipment and processes to be used in processing whole shingles into RAS in sufficient quantities to meet the needs of the project.
5. Detailed description of how the RAS material will be stored.

Alternatively, a Facility Site Visit by the Contracting Agency may be conducted in substitute of the RAS Operations Process Report.

4.4 FACILITY ACCESS AND INSPECTIONS BY LOCAL AND STATE OFFICIALS

4.4.1 Engineer Access Permitted

The Engineer of the Contracting Agency shall be allowed access to all process components at all times of operation. These process components may include, but are not limited to: whole shingle receiving, whole shingle stockpiling, shingle processing (grinding and screening), and RAS storage. The Contracting Agency shall have reasonable access to all facility process components for ascertaining whether the materials and work, as performed, are in accordance with the requirements and intent of the 2010 RAS Specification Guidelines.

4.4.2 Other Officials Access Permitted

The Shingle Recycling Operator shall permit access by local and/or state officials for the purpose of determining compliance or providing technical assistance to the Shingle Recycling Operator on how to achieve compliance with health, safety, and environmental requirements.

4.5 CERTIFICATION OF ABILITY TO MEET STANDARDS

The Shingle Recycling Operator must submit a completed and signed form that certifies the Shingle Recycling Operator and Recycling Facility meet the requirements and standards of the 2010 RAS Specification Guidelines. (See Appendix C: Shingle Recycling Operator Certification Form.)

5. LIST OF APPENDICES

Appendix A: List of Reviewers of 2010 RAS Specification Guidelines

Appendix B: Acronyms and Abbreviations

Appendix C: Shingle Recycling Operator Certification Form

Appendix D: Selected Test Methods from WSDOT's Materials Manual

Appendix E: Summary of Relevant Washington State Regulatory Agencies

Appendix F: Asbestos Information Resources

Appendix G: Shingle Recycling Operator Load Inspection Form

5.1 APPENDIX A: REVIEW OF 2010 RAS SPECIFICATION GUIDELINES

The following individuals provided specific input on the 2010 RAS Specification Guidelines:

Dave Bell, Lakeside Industries

Bill Brickey, Granite Construction Company

Andy Comstock, Tacoma-Pierce County Public Health

Joe DeVol, Washington State Department of Transportation Materials Lab

Aran Enger, Snohomish Health District

Rick Hess, Puget Sound Clean Air Agency

David Johnson, Washington State Department of Labor and Industries

Kevin Kelsey, King County Road Services Division Materials Lab

Nancy Lee, Washington State Labor and Industries

Chuck Matthews, Washington State Department of Ecology

David McAuley, CEMEX

Frank Overton, King County Road Services Division

Steven Read, Seattle Public Utilities Materials Lab

Rick Stewart, Stewart Roofing

Craig Vierling, CDL Recycle

Representatives from the following organizations also provided input on previous versions of King County's RAS Specification:

American Roofing Recyclers

Glacier Recycle

Public Health-Seattle & King County

Seattle Department of Transportation

Woodworth & Company

5.2 APPENDIX B: ACRONYMS AND ABBREVIATIONS

Acronym	Term
AASHTO	American Associations of State Highway and Transportation Officials
AC	Asphalt content
ACM	Asbestos Containing Material as defined by EPA National Emission Standards for Hazardous Air Pollutants regulations.
AHERA	Asbestos Hazard Emergency Response Act
C&D	Construction and demolition
EPA	U.S. Environmental Protection Agency
IAATL	Independent Accredited Asbestos Testing Laboratory
KCRSD	King County Road Services Division
KCSWD	King County Solid Waste Division
L&I	Washington State Labor and Industries
NAPA	National Asphalt Pavement Association
NESHAP	National Emission Standards for Hazardous Air Pollutants
OSHA	U.S. Occupational Safety and Health Administration
PLM	Polarized light microscopy
WSDOT	Washington State Department of Transportation

5.3 APPENDIX C: SHINGLE RECYCLING OPERATOR CERTIFICATION FORM

The Shingle Recycling Operator must complete the information below to certify that it and its Recycling Facility are able to meet the standards of the 2010 RAS Specification Guidelines.

Shingle Recycling Operator

Company name _____

Address _____

Website _____

Recycling Facility Address
(if different from Company Address) _____

Contact Name _____

Phone number _____

Email _____

CERTIFICATION

We the undersigned will meet and adhere to the 2010 RAS Specification Guidelines. In addition, we certify the following:

We currently have the equipment and operations in place to meet the outlined standards and requirements for producing the necessary quantity of RAS.

We agree to openly communicate about the production of the final RAS product and to respond to specific requests from the Contracting Agency.

We agree to let the Contracting Agency and/or other local and state agencies sample and test the whole shingles and/or RAS product as necessary during the production process.

We agree to utilize Asbestos Hazard Emergency Response Act (AHERA)-accredited staff or contractors to inspect incoming loads tear-off asphalt shingles and other asbestos management requirements of the 2010 RAS Specification Guidelines.

We agree to submit all necessary documentation, including but not limited to sampling and testing instructions to IAATL, laboratory reports, asbestos assessment reports, proof of AHERA-accreditation of staff or contractors, as required by the 2010 RAS Specification Guidelines.

Print Name _____ **Title** _____

Signature _____ **Date** _____

5.4 APPENDIX D: SELECTED TEST METHODS FROM WSDOT'S MATERIALS MANUAL

The following is a summary of relevant test methods from WSDOT's Materials Manual (January 2010), which reflects the continual policy of adopting consensus standards across AASHTO, ASTM, WAQTC, and WSDOT test methods wherever possible.¹

The full Materials Manual can be accessed online at <http://www.wsdot.wa.gov/publications/manuals/fulltext/M46-01/Materials.pdf> as described on the WSDOT web page: <http://www.wsdot.wa.gov/Publications/Manuals/M46-01.htm>

The Contracting Agency team members, working with WSDOT, will provide informational technical assistance on these procedures to the Shingle Recycling Operator proposed to supply the RAS product for this specified project.

<u>Procedure</u>	<u>Number</u>	<u>Owner</u>	<u>Test Method (January 2010)</u>
T	27/11	WSDOT	FOP for WAQTC/AASHTO for Sieve Analysis of Fine and Coarse Aggregates
T	308	WSDOT	FOP for AASHTO for Determining the Asphalt Binder Content of Hot Mix Asphalt (HMA) by the Ignition Method
T	2	WSDOT	FOP for AASHTO for Standard Practice for Sampling Aggregates

¹ WSDOT annually publishes an updated version of its Materials Manual every January.

5.5 APPENDIX E: DESCRIPTION OF RELEVANT WASHINGTON STATE REGULATORY AGENCIES

Local Health Department: Washington has 35 local health departments/districts to serve 39 counties. Local health departments have a broad range of regulatory authority and carry out a variety of programs to promote healthy communities. Specifically related to the 2010 RAS Specification Guidelines, local health departments issue and enforce solid waste handling permits that may include operations plans for processing tear-off asphalt shingles. The health departments also review permit exemptions for approval. They ensure that any facility that processes tear-off asphalt shingles is in compliance with WAC 173-350-040 Performance standards.

Washington State Department of Labor & Industries (L&I): L&I is a state agency dedicated to protecting worker health and safety and is among the framework of agencies that regulate asbestos in Washington State. The Division of Occupational Safety & Health (DOSH) is responsible for administering the Washington Industrial Safety & Health Act (WISHA), a state run OSHA program. Both WISHA and portions of the Safety and Health Core Rules (WAC 296-800) such as Accident Prevention Program, First Aid, and Worker Right-to-Know will apply to shingles processors.

Clean Air Authority: Air quality in Washington State is protected in most areas by Clean Air Agencies. These agencies are part of the framework in Washington State that regulates asbestos. The Puget Sound Clean Air Agency, for example, has authority to protect air quality in Snohomish, King, Kitsap, and Pierce Counties. Tribal governments or the Washington State Department of Ecology have authority in the areas not managed by Clean Air Agencies. For Shingles Recycling Operators and Shingle Recycling Facilities, the Clean Air Authority enforces the standards and protocols associated with asbestos control standards and testing.

Washington State Department of Ecology (Ecology): Ecology's mission is to protect, preserve and enhance the state's environment. They develop and enforce rules in support of Washington's environmental laws. Under the heading of managing and reducing waste, Ecology administers and enforces solid waste rules and regulations. In this role, Ecology requires that recycling facilities comply with Washington's solid waste handling regulations (Chapter 173-350 WAC).

5.6 APPENDIX F: ASBESTOS INFORMATION RESOURCES

The following resources provide additional information about asbestos management and regulations. These resources are for reference and educational purposes only.² For more in-depth information, please contact the asbestos regulatory agency in your region. Most of these resources are specific to Puget Sound and the State of Washington. Others are national in scope.

Puget Sound Clean Air Agency (PSCAA)

“Asbestos & Demolition” www.pscleanair.org/regulated/asbestos/default.aspx

“Asbestos Survey Guidance” www.pscleanair.org/regulated/asbestos/66-149%20Asbestos%20Survey%20Guidance.pdf (Internet Explorer only).

“Dealing with Asbestos: Information for General Contractors Doing Renovations”
www.pscleanair.org/regulated/asbestos/contractors/renovations.aspx

“Dealing with Asbestos: Information about Multiple-Unit Structures”
www.pscleanair.org/regulated/asbestos/contractors/multiple-unit.aspx

“How to Dispose of Asbestos-Containing Waste”
www.pscleanair.org/regulated/asbestos/disposal.aspx

“Asbestos Forms & Resources” www.pscleanair.org/regulated/asbestos/forms.aspx

“Frequently Asked Questions about Asbestos Removal & Demolition”
www.pscleanair.org/regulated/asbestos/asbestos_faqs.aspx

Washington State Department of Labor and Industry (L&I) information fact sheets:

“Asbestos Removal Requirements”
www.lni.wa.gov/TradesLicensing/LicensingReq/Asbestos/default.asp

“General Occupational Health Standards: Asbestos, Tremolite, Anthophyllite, and Actinolite”
www.lni.wa.gov/wisha/rules/generaloccupationalhealth/HTML/62I-1_2.htm#WAC296-62-07721

“Asbestos Removal - Building Owners’ Responsibilities”
www.lni.wa.gov/TradesLicensing/LicensingReq/Asbestos/default.asp#2

“Asbestos Removal - Contractors’ Responsibilities”
www.lni.wa.gov/TradesLicensing/LicensingReq/Asbestos/default.asp#3

² The contents of these external private resources do not necessarily reflect the views or policies of King County. The mention of private trade names, individual companies, commercial products, or inclusion of web links to private websites describing such materials or services is provided for information exchange and educational purposes only. Such mention does not constitute an endorsement, recommendation for use, or any form of implied warranty.

“Contractor Information Asbestos in Construction” and “Building Owner Information Asbestos in Construction” www.lni.wa.gov/WISHA/p-ts/Asbestos/AsbestosSurveys.pdf

“Asbestos Removal – Licensing and Registration”
www.lni.wa.gov/TradesLicensing/LicensingReq/Asbestos/#4

Washington State Department of Ecology:

“Asbestos in Demolition Debris Summary”
www.ecy.wa.gov/programs/hwtr/demodebris/pages2/asbsummary.html

“Banned Asbestos Building Products”
www.ecy.wa.gov/programs/hwtr/demodebris/pages2/bannedasb.html

“State Asbestos Regulations and Guidance”
<http://www.ecy.wa.gov/programs/hwtr/demodebris/pages2/asbregsstate.html>

“Local Clean Air Agencies”
<http://www.ecy.wa.gov/programs/air/local.html>

Construction Materials Recycling Association (CMRA) – www.ShingleRecycling.org:

Recycling Tear-Off Asphalt Shingles: Best Practices Guide (Oct. 2007)
www.shinglerecycling.org/sites/www.shinglerecycling.org/files/shingle_PDF/ShingleRecycling-BPG-DFK-3-22-2010.pdf.

Environmental Issues Associated with Asphalt Shingle Recycling
www.shinglerecycling.org/sites/www.shinglerecycling.org/files/shingle_PDF/EPA%20Shingle%20Report_Final.pdf

The CMRA [ShingleRecycling.org](http://www.ShingleRecycling.org) website has a good library of asbestos management advisory documents on the web page: *“Asbestos in Asphalt Shingles”* www.shinglerecycling.org/content/asbestos-asphalt-shingles.

5.7 APPENDIX G: SHINGLE RECYCLING OPERATOR LOAD INSPECTION FORM

Trained staff (an AHERA-accrediting building inspector as per Section 3.2.1 of these 2010 RAS Specification Guidelines) employed by, or under contract with, the Shingle Recycling Operator must complete the information below. This form documents the visual inspection of each load as required by these 2010 RAS Specification Guidelines, Sections 2.2 and 3.2 of this RAS specification.

Incoming loads shingles will be kept separate from shingle stockpiles until the material has been visually inspected. The trained staff will inspect each load and make notes on this form as to the characteristics of the load. The form shall be kept on file and submitted to the Contracting Agency for each load of shingles.

Date _____ Time _____

Load received from (insert company name) _____

Amount of roofing material _____ Tons OR _____ Cubic yards

This load was inspected and

DOES NOT include any visible, potential ACM according to my training.

DOES contain visible, potential ACM according to my training. The load was then:

segregated for sorting and testing per section 3.2.2 of the 2010 RAS Specification Guidelines.

OR

assumed to contain ACM and disposed of accordingly per local, state and federal regulations.

Name of AHERA-accredited staff _____

Title _____

Signature _____ Date _____