

TECHNICAL SPECIFICATIONS
FOR
RECYCLED ASPHALT SHINGLES

1. Description

Recycled Asphalt Shingles (RAS), as an asphalt binder source, may be included in plant mixed asphalt mixtures produced under Technical Specification 9.0 for Bituminous Plant Mix Base and Technical Specification 10.0 for Asphaltic Concrete Surface.

2. Materials

RAS may be included in both mainline wear and non-wear courses to a maximum of 5 percent of the total weight of mixture. The percentage of RAS used will be considered part of the maximum allowable RAP percentage (see Tables in Subsections 307.03 (B) and 411.03 (C) of TDOTSS, January 1, 2021 and all Supplemental Specifications pertaining thereto issued prior to the advertisement of this contract.) The percentage of virgin asphalt binder to total asphalt binder shall be 65% or greater for all Subsection 307 mixes, and 80% or greater for all Subsection 411 mixes. Either the mix producer or the RAS supplier shall obtain a representative sample from the recycled material stockpile and establish a gradation and asphalt cement content as required. The Contractor shall determine the gradation and asphalt content of the recycled material at the beginning of a project and every 2,000 tons (2,000 metric tons) thereafter. The stockpile asphalt cement content for all recycled material shall not vary by more than 0.8%. All RAS material shall be processed to meet with the following gradation requirements:

Gradation (% passing)	
<u>Sieve Size</u>	<u>(% passing)</u>
3/8 inch (9.5 mm)	100
#4 (4.75 mm)	90

To conduct the gradation testing, a 500-700 gram sample of processed shingle material is air dried and then dry sieved over the 3/8" and #4 sieves and weighed. Shingle asphalt binder content is to be determined by AASHTO T-164 Method A. To determine the percent asphalt content, use a 500-700 gram sample. For Mix Design purposes, the following aggregate gradation may be used as a standard gradation in lieu of determining the shingle gradation by AASHTO T30.

<u>Sieve Size</u>	<u>% Passing</u>
3/8 inch (9.5 mm)	100
#4 (4.75 mm)	97
#8 (2.36 mm)	95
#16 (1.16 mm)	80
#30 (0.60 mm)	60
#50 (0.30 mm)	50
#100 (0.150 mm)	40
#200 (0.075 mm)	30

An aggregate bulk specific gravity (G_{sb}) of 2.650 may be used in lieu of determining the shingle aggregate G_{sb} AASHTO T84).

Deleterious Materials

Scrap asphalt shingles shall not contain extraneous waste materials. Extraneous materials including, but not limited to, asbestos, metals, glass, rubber, nails, soil, brick, tars, paper, wood, and plastics shall not exceed 0.5 percent by weight as determined on material retained on the 4.75-mm (No. 4) sieve. To conduct deleterious material testing, a representative 500-700 gram sample of processed shingle material is sieved on the #4 sieve and any extraneous waste material retained on the #4 sieve is picked and weighed. The percent extraneous is based on the total sample weight. RAS shall contain less than the maximum percentage of asbestos fibers based on testing procedures and frequencies established by TDOT, state or federal environmental regulatory agencies.

3. Construction Requirements

RAS shall be stockpiled separate from other salvage material. Blending of RAS material in a stockpile with other salvage material is prohibited. Blending of Manufacture Waste Scrap Shingles (MWSS) and Tear-Off Shingle Scrap (TOSS) is not allowed. Blending of a virgin sand material with the processed shingles, to minimize agglomeration of the shingle material, is allowed, but, the blended sand must be accounted for in the mixture design. Before a Mixture Design Report for a particular mixture is authorized, the following shall be submitted, along with materials and paperwork required by Subsection 407.03 of the TDOTSS, January 1, 2021 and all Supplemental Specifications thereto pertaining issued prior to the advertisement for this contract. The following additional information must be provided:

- Certifications by the processor of the shingle scrap, as to the shingle scrap content and source.

Certification forms are located at the back of this provision and also available from the Bituminous Office.

4. Method of Measurement

- (a) Bituminous plant mix base, including the mineral aggregate and asphalt cement as specified or required by these Specifications, will be measured by the ton of 2,000 pounds, accepted and placed as indicated or directed.
- (b) Asphaltic concrete surface shall include mineral aggregate and asphaltic cement. Measurement shall be by the ton of 2,000 pounds of asphaltic concrete surface accepted and placed as indicated or directed.
- (c) Materials for prime or tack coat will be measured for payment as prescribed in their Specifications.
- (d) The surface measurements of any pavement, base or sub-base removal shall be made in square yards by the Engineer prior to backfilling.
- (e) Bituminous mixtures used to fill openings left by pavement removal will be measured for payment. Base materials used to fill openings left by base removal will be measured as provided for in the respective Sections for each type specified.
- (f) Adjustment of sewer manholes and castings will be measured for payment as prescribed in its Specification.
- (g) No allowance will be made for unacceptable material, for material used in replacing defective or condemned construction, or for materials wasted in handling, hauling,

or otherwise.

5. Basis of Payment

- (a) The accepted quantity of bituminous plant mix base, complete in place, will be paid for at the Contract Unit Price per ton for each "Grading" listed in the Bid Schedule and constructed in accordance with the Plans and Specifications.
- (b) The accepted quantity of Mineral Aggregate and Asphalt Cement (PG-64-22) for Asphaltic Concrete Surfaces, complete in place shall be paid for at the Contract unit price per ton listed in the Bid Schedule. This price shall be full compensation for all work, materials, labor and other incidentals required to complete the work in accordance with the Plans and Specifications.
- (c) The accepted quantity of pavement, base and subbase removal up to 3 feet in depth will be paid for at the Contract Unit Price per square yard listed in the Bid Schedule and performed in accordance with the Plans, Specifications, and under the direction of the Engineer.



Recycled Asphalt Shingle Certification

TEAR-OFF PROCESSOR: _____

Project No: _____ **Project:** _____

Name: _____

Address: _____

Contact: _____

Phone: _____

We the undersigned certify that all of the asphalt shingle tear-off scrap is derived from non-regulated facilities such as private, pitched roof, residential “single family” re-roofing projects (e.g., buildings with up to four units per structure). We certify that this shingle scrap material contains only shingles; no other material was added or introduced to this shingle scrap. We also certify the material contains no asbestos greater than the NESHAP threshold or other hazardous material. Additionally, we certify the RAS meets the City of Knoxville’s gradation and deleterious material requirements for processed shingle scrap.

Processor of Tear-Off Shingle Scrap Material Date

Name of Contractor to Whom Processed Tear-Off Shingle Scrap Material Was Supplied

Supplier of Tear-Off Shingle Scrap:

Name: _____

Address: _____

Contact: _____

Phone: _____