RECYCLED ASPHALT SHINGLES

BY

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Why Recycled Shingles?

- A good source for asphalt
- Reduces landfill consumption
- Conserves natural resources

11 MILLION TONS OF ASPHALT SHINGLE WASTE IS GENERATED EACH YEAR IN THE U.S.

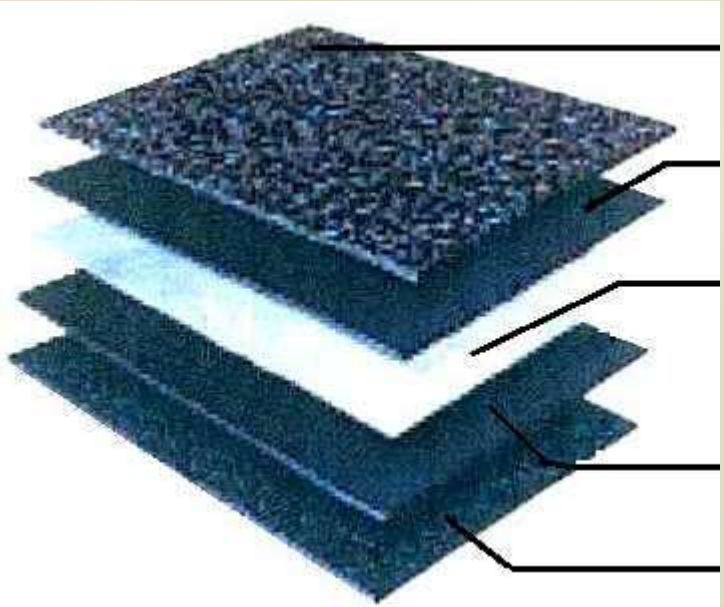
ASPHALT SHINGLE WASTE MAKES UP 8% OF TOTAL BUILDING WASTE.

1 TON OF SHINGLES

=

1 BARREL OF OIL

Typical Shingle Composition



Granular/aggregate

Waterproofing asphalt

Base (fiberglass or organic felt)

Waterproofing asphalt

Back surfacing

Component	Organic Felt	Fiberglass Mat
Asphalt cement	**30-36%**	**19-22%**
Felt (Fiber)	2-15%	2-15%
Mineral aggregate (#30)	20-38%	20-38%
Mineral filler/stabilizer	8-40%	8-40%

TYPES OF RECYCLED SHINGLES

1. MANUFACTURED SHINGLES (WASTE):
   (AVERAGE OF 20% ASPHALT)

2. TEAR-OFFS FROM RE-ROOFING
   (AVERAGE OF 30% ASPHALT DUE TO LOSS OF STONE. TENDS TO BE STIFFER ASPHALT DUE TO OXIDATION.)

AREAS OF CONCERN

- Ground shingles retain moisture
- RAS must be clean and trash free
- RAS not ground fine enough

MIX CONCERNS

- TENDENCY TO STIFFEN QUICKER OVER STANDARD HMA
- EXCEEDING BINDER RATIO
- MIX IS STIFFER WITH HIGHER PG GRADED ASPHALT

RAS STUDIES

EXTENSIVE STUDIES BY VERMONT, IOWA AND ONTARIO AND LAFARGE

RESULTS

- RAS ASPHALT REQUIRES LESS COMPACTION
- SUBSTANTIAL DECREASE IN COLD TEMPERATURE SUSCEPTIBILITY (LESS CRACKING DUE TO FIBROUS MATERIALS IN THE SHINGLES)
- LESS FATIGUE CRACKING
- DECREASED RUTTING
- DECREASED NEED FOR VIRGIN ASPHALT BINDER
- TENDS TO INCREASE AIR VOIDS IN MIX

HOWEVER

THE ONTARIO STUDY INDICATED THE USE OF TEAR-OFF SHINGLES MAY CAUSE THE HMA TO BECOME TOO BRITTLE AND MAY CONTRIBUTE TO LOW TEMPERATURE CRACKING.

STATES SUCH AS IOWA AND NORTH CAROLINA DO NOT ALLOW TEAR-OFF SHINGLES DUE TO THE INCONSISTENT CHARACTERISTICS OF THE WEATHERED ASPHALT.

MIX LIMITS FROM OTHER STATES

- Texas limits RAS to 5% and 35% Recycled Binder
- Minnesota limits RAS to 5% and 25% Recycled Binder
- Missouri limits RAS to 7%
- North Carolina limits RAS to 5%
- Iowa limits are 2%-7% with 2/3 of the asphalt binder from shingles counting toward total binder.
- Ontario limits are 5% RAS
- AASHTO specs allow as much as 3% RAS
- Wisconsin allows 20% binder replacement from RAS on lower layers and 15% on upper layers

BINDER REPLACEMENT

SAY 5% RAS ALLOWED BY WEIGHT. RAS HAS 20% ASPHALT ON AVERAGE. THAT IS 1% EFFECTIVE ASPHALT BINDER.

TYPICAL MIX HAS 5.75% TOTAL BINDER.

1/5.75 = .174 or 17.4%

IF ONLY 2/3 OF THE RAS IS EFFECTIVELY USED THEN

THE EFFECTIVE BINDER REPLACEMENT IS 11.6%.

MICHIGAN
DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION
FOR
RECYCLED HOT MIX ASPHALT MIXTURE
(PERMISSIVE USE OF RECYCLED ASPHALT SHINGLES)

Delete the first paragraph of subsection 502.02.A.2, on page 227 of the Standard Specifications for Construction in its entirety and replace it with the following:

2. **Recycled Mixtures.** Substitution of reclaimed asphalt pavement (RAP) or recycled asphalt shingles (RAS) for part of the raw materials required to produce the HMA is acceptable as described in the following subsections. Produce the mixture according to subsection 501.02.C. Inclusion of RAP or RAS in the mixture will not change the contract unit price.

Add the following to subsection 501.02.A.2, on page 228 of the Standard Specifications for Construction.

c. **Reclaimed Asphalt Pavement (RAP), Recycled Asphalt Shingles (RAS) Percentages and Binder Grade Selection.** The method for determining the binder

MICHIGAN: PROJECT SPECIFIC SPECIAL PROVISION

- PERMISSIVE USE OF RAS
- ALLOWS SUBSTITUTION OF RAS FOR RAP
- UP TO 27% BINDER REPLACEMENT FOR TIER 2 HMA. COULD BE ALL RAS.

SHINGLE GRADATION

- MOST STATES REQUIRE THE SHINGLES TO BE GROUND TO LESS THAN ½" IN SIZE.
- A FEW STATES REQUIRE THE SHINGLES BE GROUND TO LESS THAN 3/8".
- THE SMALLER SIZE ALLOWS THE SHINGLES TO INCORPORATE INTO THE MIX.
- UNDISSOLVED RAS ASPHALT BINDER ACTS LIKE AGGREGATE AND WOULD REQUIRE MORE VIRGIN BINDER FOR PROPER COATING.

EMMET COUNTY ROAD COMMISSION EXPERIENCE

HMA Mix Specification

- HMA 4E1
  - AC content to meet 3% Air Voids by regression.
  - Asphalt Performance Grade 58-28.
  - Recycled Asphalt Materials shall not contribute more than 25% by weight (mass) of the total binder content.

- Recycled Asphalt Shingles
  - Maximum of 5% of binder replacement.
  - 100% passing 1/2 “ and 90% passing #4.
  - Recycled shingles added by dedicated feed bin, no mixing in a stockpile allowed.

Edward Road – 2011

Edward Road – 2011

Valley Road – 2011

Indian Garden Road – 2010

Indian Garden Road – 2010

OTHER USES

RECYCLED SHINGLES CAN ALSO BE USED FOR AGGREGATE, DUST CONTROL ON GRAVEL ROADS, AND COLD PATCH MIXES

IOWA GRAVEL ROAD STUDY

2 YEAR STUDY: PLACED 500 TONS OF RAS (GROUND TO LESS THAN 1". MATERIAL WAS GRADED BACK & FORTH TO MIX WITH GRAVEL. RESULTS INDICATED MUCH REDUCED DUST CONTROL NEEDS, LESS RUTTING AND LESS GRAVEL LOSS.

QUESTIONS?