CERTAINTEED

RECYCLED ASPHALT SHINGLE PELLETS

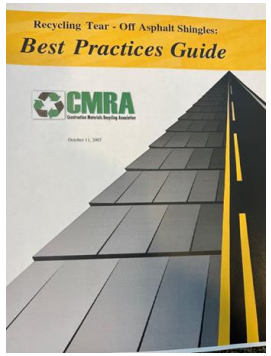
SAINT-GOBAIN

PAST CHALLENGES IN RAS USAGE

The use of RAS in pavement developed in the 1990's – 2000's without sufficient investigation of the effects of RAS on HMA

Limited studies performed on RAS in HMA

1990's



Technical information reports on RAS

Initial reports were concerned with economics, process, regulatory compliance, feedstock handling, processing.

Only an initial discussion of effects on HMA.

Early 2000's

Many recyclers entered the marketplace

- Early 2000's - many recyclers entered the RAS market.
- Tipping fees more than offset the processing cost in many areas.
- Contractors counted the asphalt introduced in RAS form as 100% effective asphalt in the HMA, when there was very little effective bitumen.
- RAS was difficult to consistently feed into the HMA plant.

CHALLENGES IN RAS USAGE

In the 2010's, asphalt in RAS started to be investigated further; pavement failures began to occur.

FHWA and NCAT published RAS asphalt cement test data

- PG grading test methodology
- Asphalt in RAS was found to be as extreme as PG 175+41

Table 2: RAS Binder Performance Grade (FHWA, 2018)

Reference	Material	High Temperature Grade	Low Temperature Grade
Standard	Virgin Binder	52°C to 76°C	−28°C to −16°C
NCAT (2014)	RAP	85°C to 95°C	−20°C to −5°C
	MWAS	125°C to 135°C	
	PCAS	150°C to 170°C	
Willis (2013)	MWAS	132°C to 154°C	−18°C to > 0°C
	PCAS	121°C to 175°C	−6.9°C to 41°C
Zhou et al. (2013)	MWAS	124°C to 138°C	
	PCAS	159°C to 214°C	
Bonaquist (2011)	RAS	110°C to 126°C	−10.1°C to 4.5°C
Willis & Turner (2016)	MWAS	126.6°C to 144.7°C	
	PCAS	144.4°C to 170.3°C	

IS 136 • NATIONAL ASPHALT PAVEMENT ASSOCIATION Guidelines for the Use of RAS in Asphalt Pavements 15

2010's

Failures in pavements containing RAS started to occur

- Premature cracking
- Stripping and ravelling

2014

RAS usage peaked and started to decline after 2014

- HMA plant personnel EHS concerns due to airborne fiberglass particulate
- Shingle mountains were created and abandoned, left to local entities to clean up

CHALLENGES IN RAS USAGE

RAS usage has fallen out of favor

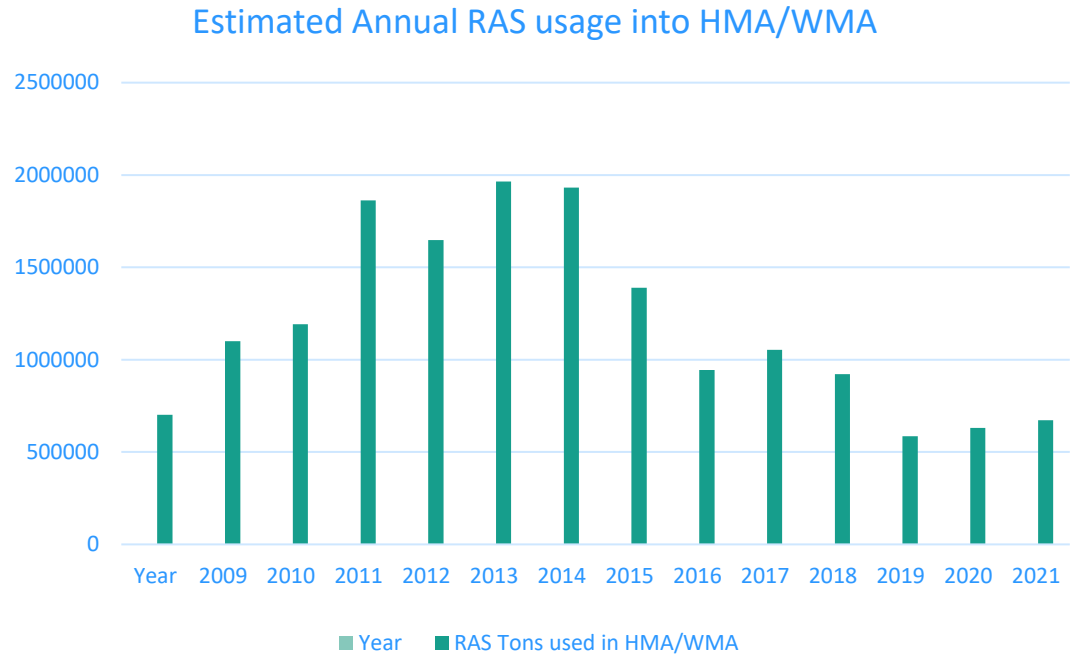
DECLINE IN SHINGLE RECYCLING

2017 – Most producers paused acceptance of unprocessed shingles.

According to the U.S. EPA, 15.1 million tons of shingle waste generated annually, of which 13 million is landfilled.

CERTAINTEED/ASPHALTICA PROCESS

CertainTeed/Asphaltica patented process will unlock the ability of HMA producers to recapture this available material without affecting the quality of pavement.



THE CERTAINTEED & ASPHALTICA SOLUTION

Pre-Treatment of RAS

RAS IS GROUND

RAS is ground to industry standard 3/8 minus.

RECYCLING AGENT ADDED

Recycling agent added, pelletized and coated with a water-resistant shell to facilitate storage and transportation.

Stores/feeds like gravel.

OXIDIZED ASPHALT IS SOFTENED

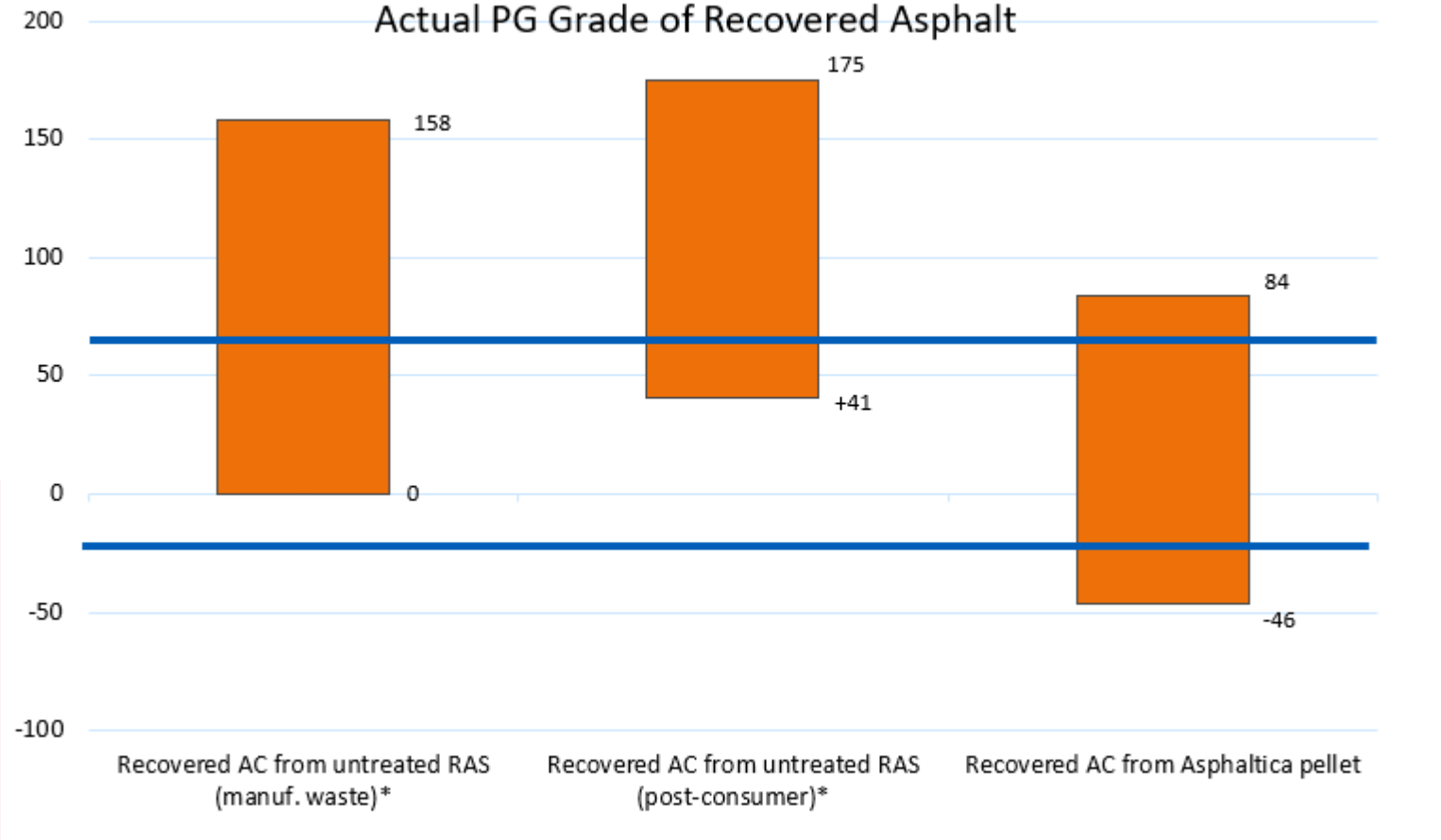
Softens oxidized asphalt to paving

PG grade.

RAS PG GRADING PROVES EFFECTIVENESS

PG GRADING OF TREATED VS. UNTREATED RAS

Once pre-treated, AC from RAS results in a very good binder for pavements.



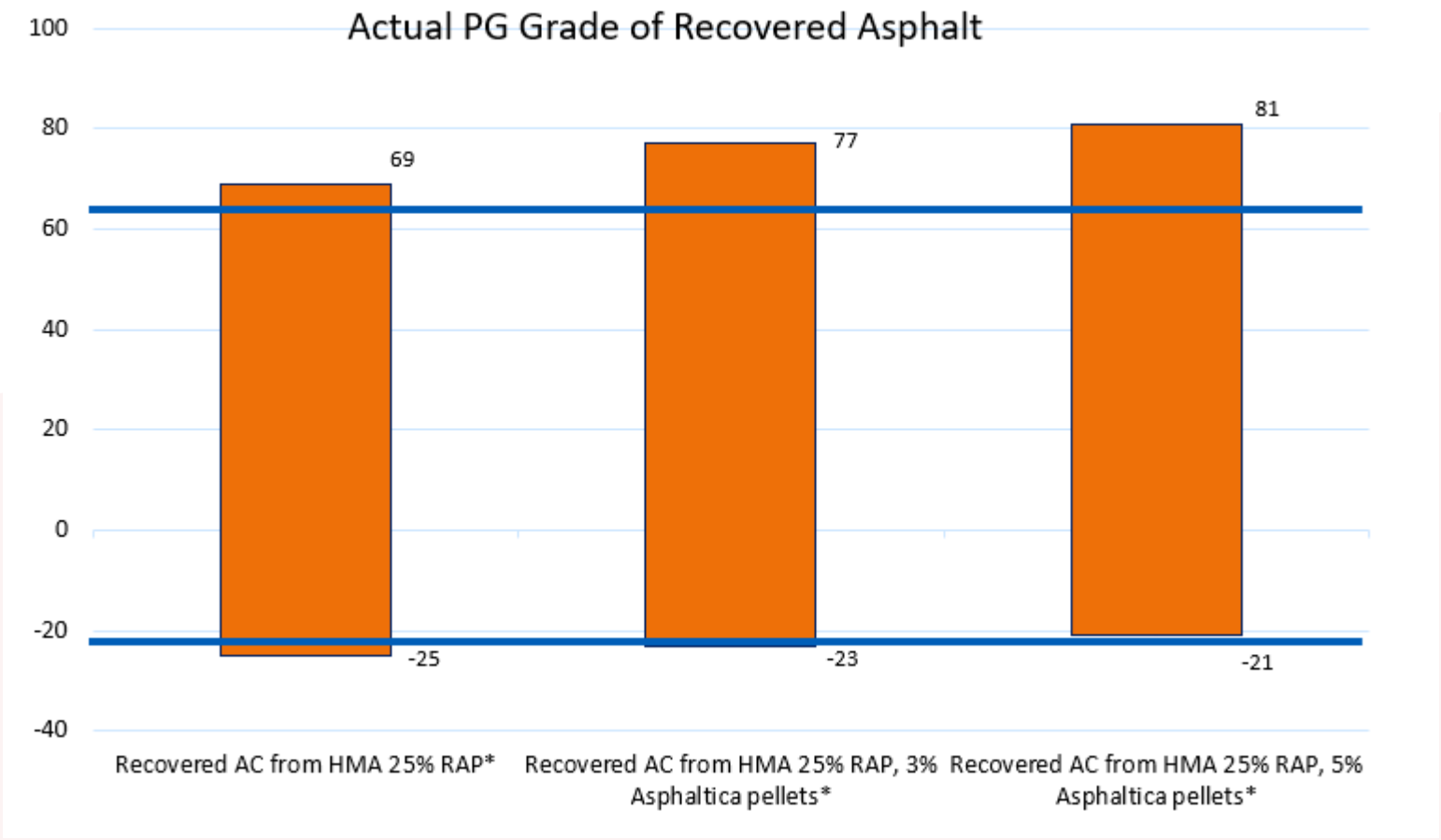
*Represents upper end of range found in Willis (2013)

Upper and lower lines reflect 64-22

HMA PG GRADING REFLECTS EQUIVALENCY

PG GRADING OF HMA WITH VS. WITHOUT TREATED RAS

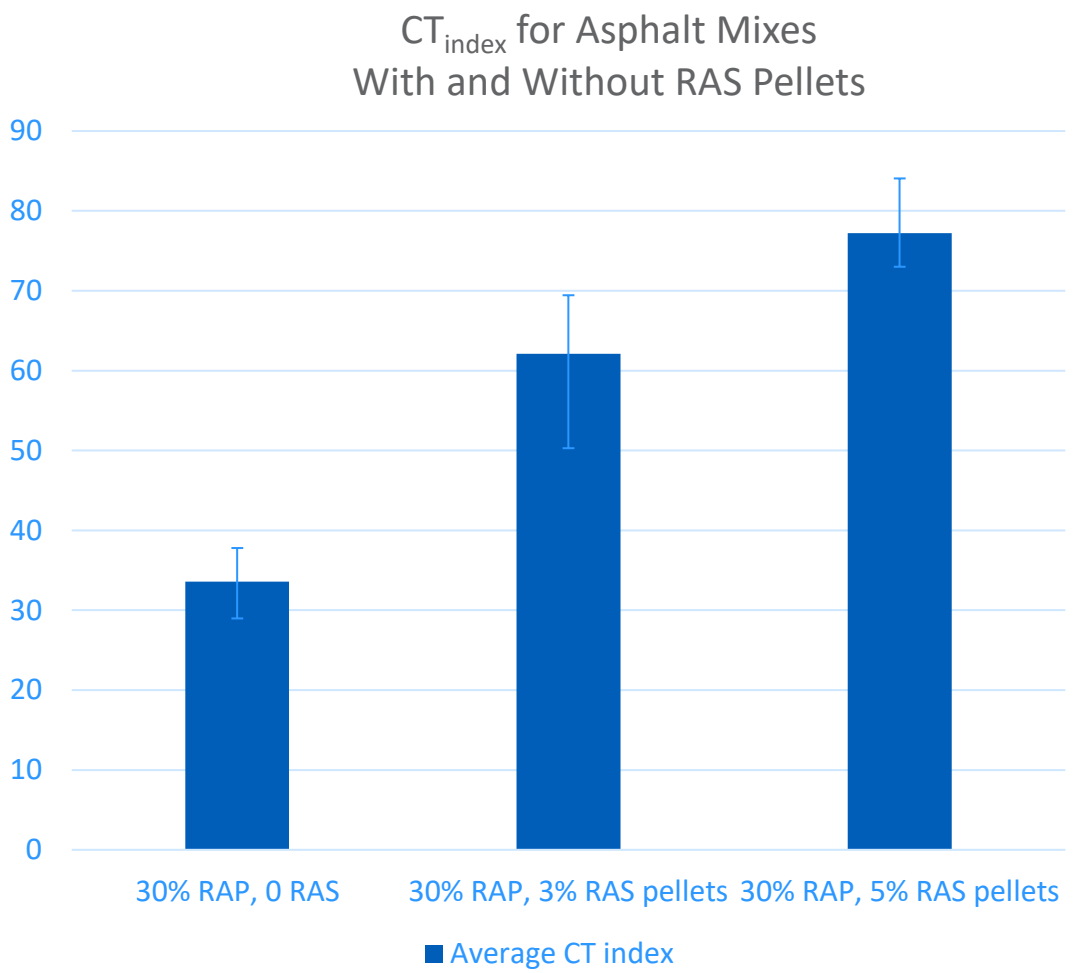
AC recovered from HMA with pelletized RAS reflect improved top end (more resistance to rutting and shoving), with minimal impact to bottom end.



*Virgin AC was PG 64-22

IDEAL-CT TESTING

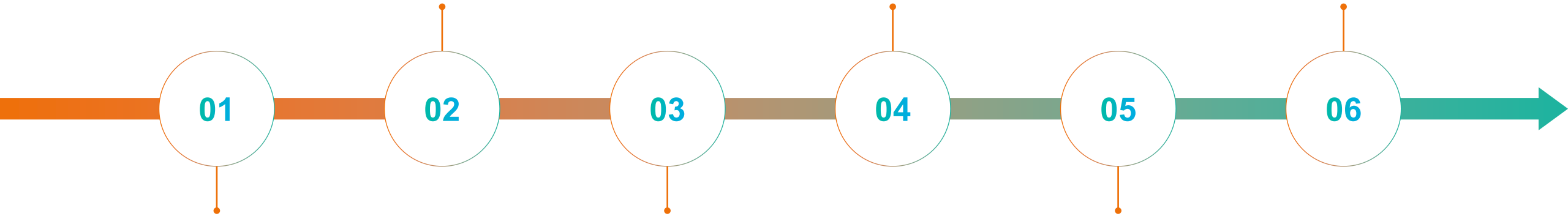
RAS pellets have a positive impact on cracking resistance.



- Asphalt Testing Services (ATS) performed IDEAL-CT tests on three mixes with different RAP/RAS levels.
  - 30% RAP, no RAS pellets
  - 30% RAP, 3% RAS pellets
  - 30% RAP, 5% RAS pellets
- Average CT index value ***increased*** with the addition of RAS pellets, from an average of 34 with no RAS, to 77 with 5% RAS pellets.

QUALITY PRODUCT

CertainTeed RAS Pellets Contribute to a Quality Product



HIGH QUALITY BINDER

As confirmed by PG grading, pre-treated RAS pellets mix well in HMA and contribute to high quality binder.

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Fiberglass fibers in shingles contribute to reduced rutting.

REDUCED RUTTING

IMPROVED CRACK RESISTANCE

IDEAL CT testing showed improved resistance to cracking with the addition of RAS pellets.

No yield loss or separation of shingle materials within the process.

NO ADDED WASTE

NO HEAT OR SOLVENTS

Pretreatment process occurs without heat or solvents.

Hydrated lime and other additives with the proprietary formulation have been proven to increase asphalt performance.

ADDITVE DELIVERY SYSTEM

ELIMINATES PLANT FEED ISSUES

- Consistent feed rate into the drum – no agglomeration.
- Controlled composition of pellets leads to a consistent HMA product.
- No special equipment needed.
- Handles like RAP.
- Virtually eliminates airborne fiberglass at HMA plant.
- Pellets can be stored indefinitely, whereas ground RAS require reprocessing if stored for more than a few weeks.

REDUCED NEED FOR VIRGIN BINDER

CertainTeed RAS Pelletization process is scalable

- Yields a high quality, paving grade asphalt from recycled shingles and displaces high cost, virgin material.
- For example, 35,000 tons of shingles will yield 7,000 tons of virgin asphalt replaced.
- At a 3% pellet content in the HMA, 35,000 tons of shingles provides enough material for ~1.2M tons HMA
- Pellet production process is scalable and modular.

UTILIZATION

Over 748,000 tons of HMA have been produced with excellent results, resulting in 22,440 tons virgin asphalt savings

CITY OF PORTLAND, OR

City of Portland Standard Constructic Specifications, 2020

CLACKAMAS COUNTY, OR

Clackamas County Roadway Standards, June 2020, references Oregon Standard Specifications for Construction.

COWLITZ COUNTY, WA

Washington DOT Standard Materials Specifications M 46-01.43

COLUMBIA COUNTY, OR

Columbia County Road Standards

CITIES OF LONGVIEW AND KELSO, WA

Washington DOT Standard Materials Specifications M 46-01.43

CONCLUSIONS

The process resolves the historic challenges with RAS, unlocking a pathway for additional recycled content in HMA/WMA.

01 EFFECTIVE BITUMEN

Pre-treatment of the shingle focuses the recycling agent on the RAS only, not the entire mix.

AC recovered from HMA with RAS pellets shows improved top end, with minimal impact to bottom end.

02 FEED INTO HMA PLANT

Easy to maintain a constant feed rate with no special equipment.

Handles the same as RAP.

Pellets can be stored indefinitely.

03 AIRBORNE FIBERGLASS MANAGED

Virtually elimates airborne fiberglass at HMA plant

04 EFFECTIVE USE FOR SHINGLE STOCKPILES

Process creates a pellet that is an ideal component of HMA, allowing for viable markets for both post-industrial and post-consumer shingles.

05 INCREASE RECYCLED CONTENT & LANDFILL DIVERSION

Allows diversion of shingles from disposal and improves the recycled content of asphalt pavement, consistent with policy goals.

THANK YOU

QUESTIONS & DISCUSSION

- Pilot opportunities
- How can we help?

Kaley Laleker
Kaley.Laleker@saint-gobain.com
410-513-6128

Maure Creager
Maure.creager@saint-gobain.com
507-330-4330

Avni Patel
Avni.patel@saint-gobain.com
484-473-5830