Reclaimed Asphalt Shingles - Demonstration Project
Presenters:

- Steven Wasosky P.E. – Design Section Manager
- Richie Dimmerling P.E. – Construction Area Engineer
Overview

- RAS overview
- Green Initiative request
- Ohio EPA Grant
- City of Columbus Citywide Resurfacing 2015 Project 1
- Specifications
- Mix Design
- Project Location
- Inspection
- Post-construction Monitoring
Thank you!

• **Ohio Environmental Protection Agency** - Grants Administrator - Chet Cheney
  - Community Recycling Grants
  - Litter Clean-up and Tire Amnesty Grants
  - Recycling Market Development Grants
  - Scrap Tire Grants

• **Flexible Pavements of Ohio**
  - Partner on Grant Application
  - Tremendous Resource on all things asphalt

• **City of Columbus** - Asst. Director of Sustainability - Randall Bowman P.E.
  - Sustainability Policy Development
  - Liaison to Mayor’s Green Team
The problem we are trying to solve
Reclaimed Asphalt Shingles (RAS)

• According to the U.S. Environmental Protection Agency, approximately 11 million tons of asphalt roofing shingles are disposed of each year. About one million tons is waste produced by the roofing manufacturers and about 10 million tons is waste produced by residential tear-off shingles. The 11 million tons amounts to about 8 percent of the nation’s total building-related waste. Recycling this waste stream makes economical and environmental sense.

• The composition of shingles makes them an especially appropriate material for use in asphalt pavements. Shingles are typically composed of 25 to 30 percent asphalt cement, 40 to 60 percent hard aggregate contained on the 30 and 60 sieves and 3 to 12 percent fiber. All of these ingredients are routinely used in hot mix asphalt (HMA) pavements.
SHINGLES BEFORE

SHINGLES AFTER
Several potential markets exist for asphalt shingles. These include:

- hot mix asphalt
- cold patch
- dust control on rural roads
- temporary roads or driveways
- aggregate road base
- new shingles
- fuel
Hot Mix Asphalt
Hot-Mix Asphalt (HMA)

- This is the largest current market for RAS. There are several benefits which can be derived from using RAS. These include:
  
- Reduced demand on virgin asphalt cement

- Reduced demand on aggregate

- Improved properties of HMA pavement
Hot-Mix Asphalt (HMA)

- The added asphalt cement decreases the demand for virgin asphalt cement. This has several benefits. Primarily, an economic advantage to the producers of HMA. Cutbacks from shingle factories can be ground up and immediately be added to the HMA process, or rejuvenated with rejuvenating chemicals prior to the HMA process. HMA requires certain gradations of aggregate. The ceramics in the shingles provide a source of aggregate, reducing the demand for mined aggregate. Certain properties of asphalt pavement have been shown to improve with the addition of RAS. These include rutting and cracking resistance. It is suspected that the added mineral fillers and organic fibers help reinforce the matrix.
Cold Patch
Cold Patch

• The use of RAS as cold patch is a practice that has been employed for years. It has been used in New Jersey, Washington, and California as well as the city of Chicago. Advantages to using cold patch comprised of RAS include the following:

• Patches have a longer life compared to other patch materials. This is likely due to the fibers from the felts or fiberglass in shingles.

• The patch material is very easy to apply. A pothole is simply filled approximately an inch over grade. No equipment is needed as the patch may be compressed by vehicle traffic. The patch is also less dense than other materials, making it easier to haul.

• The RAS cold patch material can be stored longer because it does not "clump" as quickly as other materials.
Dust Control
Dust Control

- Recycled asphalt shingles may be ground and mixed into the gravel used to cover rural, unpaved roads. The mixture leads to several improvements in these rural roads, including:
  - Dust is minimized. An Iowa DOT ["Let Me Shingle Your Roadway"] study showed little or no dust for two years on a rural road.
  - Reduced loss of gravel into side ditches.
  - Vehicle noise is reduced.
  - The roads have a longer life and require less maintenance. The study conducted by the Iowa DOT noted that the road performed well for at least two years.
Temporary Roadway/Aggregate Base
Temporary Roads or Driveways/Aggregate Base

- RAS has been used in temporary roads, driveways, or parking lot surfaces. RAS is typically ground to 1/4 inch and passed under a magnetic separator in order to sufficiently remove all nails. The processed shingles are spread and compacted for an easily installed surface. In Altus, OK, RAS was mixed with RAP to create a parking lot surface.

- Little research has been conducted into this market, but shingles have been used as part of the sub-base in road construction. Processed shingles may be blended with recycled asphalt pavement and concrete. It is suspected that the addition of RAS may improve the compaction of the sub-base.
A report prepared for the U.S. Department of Energy showed that the addition of up to 20% of recycled shingles did not affect the production of new shingles. They showed significant energy savings in using RAS.

The recovery of the BTU value of waste shingles is an established market in Europe. Only recently has the concept been applied in the United States. It is very limited, however, because of concerns over air pollution.
Partnering for The Greater Good
Green Initiative Request

- June 2014- Asst. Director of Sustainability received a request regarding the usage of RAS in our Resurfacing Program
- August 2014- Met w/ Shelly Company- Vice President of Quality Control Larry Shively to discuss RAS usage
- October 2014 Met with Flexible Pavements of Ohio and Ohio Environmental Protection Agency to discuss RAS Usage
- November 2014 Developed List of Potential RAS Streets for review
- December 2014 Draft Grant Agreement
- February 2015 Grant Agreement Finalized
- April 2015 Notice to Proceed on 2015 Resurfacing Project 1
- June 2015 Began RAS Paving
# Ohio EPA Grant – 50/50 Split

<table>
<thead>
<tr>
<th>Project Type</th>
<th>Grant Funds Requested</th>
<th>Match Funds Committed</th>
<th>Total</th>
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<tbody>
<tr>
<td>Roadway Resurfacing</td>
<td>$156,775</td>
<td>$156,775</td>
<td>$313,550</td>
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</table>

<table>
<thead>
<tr>
<th>Targeted Material(s)</th>
<th>Annually Projected Tons (TPY)</th>
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</thead>
<tbody>
<tr>
<td>ASPHALT CONCRETE SURFACE COURSE (HEAVY TRAFFIC) PG70-22M, RAS, AS PER PLAN and ASPHALT CONCRETE SURFACE COURSE (HEAVY TRAFFIC) PG64-22, RAS, AS PER PLAN</td>
<td>3,500-Tons</td>
</tr>
</tbody>
</table>
Monitoring Performance
OEPA Grant Required Performance Tracking

- Visual Observations and Measurements conducted by CoC Test Lab
- Rutting and Cracking Monitoring
- Rate of increase in rutting and cracking
- Automated ratings collected every 3 years using truck mounted sensors and Dynaflect testing
- Comparison of Standard Section
- Measured over a 5 year period with a Formal RAS performance report issued at the conclusion
Project Information

• INVITATION FOR BID:
• PROJECT NAME: RESURFACING – RESURFACING 2015 PROJECT 1
• DEPARTMENT NAME: DEPARTMENT OF PUBLIC SERVICE
• DIRECTOR: TRACIE R. DAVIES
• PROJECT NUMBER: 530282-912015
• Date Bids Due: 2/24/2015
• Low Bidder: Strawser Paving Company
Bid Unit Prices

• Asphalt Concrete, Surface Course, (Heavy Traffic), PG 70-22M (1.5”)
  – RAS APP mix 5% price increase vs. standard mix

• Asphalt Concrete, Surface Course, (Medium Traffic), PG 64-22 (1.25”)
  – RAS APP mix 15% price increase vs. standard mix
Specifications

ODOT 2013
CONSTRUCTION & MATERIAL SPECIFICATIONS

- 401.04 - Revised to allow Reclaimed Asphalt Shingles

- Supplemental Specification 800 revised the 2010 CMS in January 2011
Specifications

• ODOT 401.04

  – Maximum 5.0% RAS by dry unit weight of mix
  – Allowed RAS in Medium Traffic and Light Traffic Surface Course, Intermediate and Base Courses
  – Allowed RAS tear-offs in Intermediate and Base Courses
  – SUPPLEMENTAL SPECIFICATION 1116 Requirements for Suppliers of Reclaimed Asphalt Shingles Used in Asphalt Mixtures
<table>
<thead>
<tr>
<th>Asphalt Mix Application</th>
<th>Percent RAP by Dry Weight of Mix Max.</th>
<th>RAS Usage [1]</th>
<th>Total Virgin Asphalt Binder Content, Min.</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heavy Traffic Polymer Surface Course</td>
<td>10%</td>
<td>None</td>
<td>5.2</td>
<td>Polymerized binder is virgin. (For non-polymer virgin binder allow 20% max RAP and 5.0 min. virgin.)</td>
</tr>
<tr>
<td>Medium Traffic Surface Course</td>
<td>20%</td>
<td>Manufacturing waste only</td>
<td>5.0</td>
<td>Polymer or non-polymer virgin.</td>
</tr>
<tr>
<td>Light Traffic Surface Course</td>
<td>20%</td>
<td>Manufacturing waste only</td>
<td>5.2</td>
<td>Polymer or non-polymer virgin.</td>
</tr>
<tr>
<td>Intermediate Course</td>
<td>35%</td>
<td>Manufacturing waste and tear-offs</td>
<td>3.0</td>
<td>Any mix type used as an intermediate course.</td>
</tr>
<tr>
<td>Base Course 301</td>
<td>50%</td>
<td>Manufacturing waste and tear-offs</td>
<td>2.7</td>
<td>The Laboratory will establish the asphalt binder content.</td>
</tr>
<tr>
<td>Base Course 302</td>
<td>40% (30%)</td>
<td>Manufacturing waste and tear-offs</td>
<td>2.0</td>
<td>A lower RAP limit of 30 percent will be required if poor production mixing or coating is evident.</td>
</tr>
</tbody>
</table>

[1] No more than 5.0% RAS by dry weight of mix
Specifications

• SUPPLEMENTAL SPECIFICATION 1116 Requirements for Suppliers of Reclaimed Asphalt Shingles Used in Asphalt Mixtures

  – Reclaimed Asphalt Shingle Material Requirements
    • meets AASHTO MP 15-09, 3.2 (manufacturing waste) and 3.3 (tear-offs from residential only).
  – Reclaimed Asphalt Shingle Supplier Approval Process
    • Obtain written approval as a RAS Supplier
  – Quality Control Requirements for RAS Suppliers
    • provide a separate quality control plan
  – Quality Assurance
    • Department or other agencies may visit the processing site
Mix Design
Mix Design

**Marshall Mix Design**

**Producer:** 90  
**Project:** Columbus Resurface  
**Spec:** 441  
**Year:** 2015

<table>
<thead>
<tr>
<th>ODOT SPEC. BAND</th>
<th>% Pass Low</th>
<th>% Pass High</th>
<th>Mix Type</th>
<th>Useage:</th>
<th>Traffic Designation:</th>
</tr>
</thead>
<tbody>
<tr>
<td>2&quot; (50.8)</td>
<td>100</td>
<td>100</td>
<td>90</td>
<td>1&quot; for Surface</td>
<td>1&quot; for Light</td>
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<tr>
<td>1-1/2&quot; (38.1)</td>
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<td>100</td>
<td>441</td>
<td>0023</td>
<td></td>
</tr>
<tr>
<td>1&quot; (25.4)</td>
<td>100</td>
<td>100</td>
<td>2.41B</td>
<td>Heavy</td>
<td></td>
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<tr>
<td>3/4&quot; (19)</td>
<td>100</td>
<td>100</td>
<td>6.2</td>
<td>PG 70-22M</td>
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</tr>
<tr>
<td>3/8&quot; (9.5)</td>
<td>95</td>
<td>90</td>
<td>5.0</td>
<td>PG 70-22M</td>
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<tr>
<td>#4 (4.75)</td>
<td>54</td>
<td>50</td>
<td>SBS</td>
<td>295 F</td>
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<tr>
<td>#6 (2.36)</td>
<td>37</td>
<td>30</td>
<td>315 F</td>
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<tr>
<td>#16 (1.18)</td>
<td>18</td>
<td>12</td>
<td>0.5</td>
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<tr>
<td>#30 (0.6)</td>
<td>8</td>
<td>5</td>
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<td>NA</td>
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<tr>
<td>#50 (0.3)</td>
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<tr>
<td>#100 (0.15)</td>
<td>2</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>#200 (0.075)</td>
<td>3.1</td>
<td>2</td>
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**NOTES:**
- Lab No 20150067 COC

<table>
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<th>Type</th>
<th>Producer/Location</th>
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<tr>
<td>56</td>
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<td>GRILS</td>
<td>Shelly Materials-Columbus, Oh (Pugmill)</td>
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**Coarse aggregate**

<table>
<thead>
<tr>
<th>%</th>
<th>Size</th>
<th>Type</th>
<th>Producer/Location</th>
<th>ODOT Gab</th>
<th>Code</th>
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<tbody>
<tr>
<td>16</td>
<td>#5</td>
<td>Natural</td>
<td>Mar Zane Zanesville, Oh</td>
<td>04416-01</td>
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<tr>
<td>15</td>
<td>Sand</td>
<td>Limestone</td>
<td>Shelly Materials-Columbus, Oh</td>
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<td>2.602</td>
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**Fine aggregate**

<table>
<thead>
<tr>
<th>%</th>
<th>AC Type</th>
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<th>Composition</th>
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<tr>
<td>9</td>
<td>5.50</td>
<td>Standard</td>
<td>Composite 15-Fine Rap</td>
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<tr>
<td>4</td>
<td>18.00</td>
<td>Extended</td>
<td>Pit 90 Shingles</td>
<td>2.383</td>
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**RAP & Shingles**

<table>
<thead>
<tr>
<th>%</th>
<th>Type</th>
<th>Source</th>
<th>Composition</th>
<th>ODOT Gab</th>
<th>Code</th>
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<tbody>
<tr>
<td>35</td>
<td>AVG</td>
<td>3.35</td>
<td></td>
<td>2.590</td>
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</table>

*If RAP taken from State route, enter State route and project.
If other recycled material, or RAP taken from non-State route, enter size, type and source/location of fine and coarse aggregate, and source of information.

**For Official Use Only**

AT OPTIMUM AC CONTENT:

- Maximum Theoretical Stability
- Date Approved: JMF
- Calibration #: 9204
Mix Design

**Producer**
- **90**

**Project**
- Columbus Resurface

**Spec**
- 441

**Year**
- 2015

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### ODOT SPEC BAND

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<tr>
<th>Sieve</th>
<th>% Pass Low</th>
<th>% Pass High</th>
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<tbody>
<tr>
<td>3&quot; (76.2)</td>
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<td>100</td>
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<td>1-1/2&quot; (38.1)</td>
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<td>100</td>
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<tr>
<td>1&quot; (25.4)</td>
<td>55</td>
<td>0</td>
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<tr>
<td>3/4&quot; (19)</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>1/2&quot; (12.7)</td>
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<td>100</td>
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<td>3/8&quot; (9.5)</td>
<td>95</td>
<td>100</td>
</tr>
<tr>
<td>#4 (9.5)</td>
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<td>37</td>
<td>50</td>
</tr>
<tr>
<td>#10 (1.78)</td>
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<td>#15 (1.18)</td>
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</tr>
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<td>#20 (0.88)</td>
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<td>#30 (0.47)</td>
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<td>30</td>
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<td>#50 (0.35)</td>
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<td>#80 (0.177)</td>
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</tr>
<tr>
<td>#200 (0.075)</td>
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**NOTES:**
- Lab No 20150068 COC

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### Coarse aggregate

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<tbody>
<tr>
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<td>Shelly Materials-Columbus, Ohio (Used)</td>
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### Fine aggregate

<table>
<thead>
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<th>Type</th>
<th>Producer/Location</th>
<th>Code</th>
<th>ODOT Gsb</th>
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<tbody>
<tr>
<td>16</td>
<td>Sand</td>
<td>Natural</td>
<td>Mar Zane-Zanesville, Ohio</td>
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<td>2.571</td>
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<td>Sand</td>
<td>Limestone</td>
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<td>04502-01</td>
<td>2.602</td>
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</table>

### RAP & Shingles

<table>
<thead>
<tr>
<th>%</th>
<th>% AC</th>
<th>Source</th>
<th>Composition</th>
<th>Gse</th>
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</thead>
<tbody>
<tr>
<td>10</td>
<td>5.50</td>
<td>X</td>
<td>Composite 15-Fine Rap</td>
<td>Limestone</td>
</tr>
<tr>
<td>4</td>
<td>18.00</td>
<td>X</td>
<td>Pit 60 Shingles</td>
<td>Shingles</td>
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</table>

**AVG**
- 9.07

*If RAP taken from State route, enter State route and project.
If other recycled material, or RAP taken from non-State route, enter size, type and source/location of fine and coarse aggregate, and source of information.*

---

### AT OPTIMUM AC CONTENT:

<table>
<thead>
<tr>
<th>Original Rc'd.</th>
<th>Resubmit Rc'd.</th>
<th>Air Voids</th>
<th>VMA</th>
<th>UnitWI</th>
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</table>

<table>
<thead>
<tr>
<th>Maximum Theo.</th>
<th>Stability</th>
<th>Flow</th>
<th>Opt. At Median Air Voids</th>
<th>2 Points Above and Below Opt.?</th>
<th>Date Approved</th>
<th>JMF</th>
<th>Calibration #</th>
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<tr>
<td>X</td>
<td>X</td>
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<td></td>
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</tr>
</tbody>
</table>

**THE CITY OF COLUMBUS**

ANDREW J. GINThER, MAYOR

DEPARTMENT OF PUBLIC SERVICE
### Mix Design

**THE CITY OF COLUMBUS**  
ANDREW J. GINThER, MAYOR  
DEPARTMENT OF PUBLIC SERVICE

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#### THE SHELLY COMPANY  
MARSHALL MIX DESIGN

**Producer:** 90  
**Project:** Columbus Resurface  
**Spec:** 441  
**Year:** 2015

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<table>
<thead>
<tr>
<th>ODOT SPEC, BAND</th>
<th>% Pass Low</th>
<th>% Pass High</th>
</tr>
</thead>
<tbody>
<tr>
<td>2&quot; (50.8)</td>
<td>100</td>
<td>100</td>
</tr>
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<td>1-1/2&quot; (38.1)</td>
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<td>100</td>
</tr>
<tr>
<td>1&quot; (25.4)</td>
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<td>100</td>
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<tr>
<td>3/4&quot; (19)</td>
<td>100</td>
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<tr>
<td>1/2&quot; (12.7)</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>3/8&quot; (9.5)</td>
<td>56</td>
<td>50</td>
</tr>
<tr>
<td>#4 (4.75)</td>
<td>37</td>
<td>30</td>
</tr>
<tr>
<td>#20 (.88)</td>
<td>9</td>
<td>5</td>
</tr>
<tr>
<td>#60 (.065)</td>
<td>3.1</td>
<td>NA</td>
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</tbody>
</table>

**Mix Type:**  
- **Usage:** ("Y" for Surface)  
- **Traffic Designation:** ("Y" for Heavy, "F" for Light)  
- **Line Item Reference Number:** 0024

**Type 1 RAS 64-22**  
- **Surface:** Medium

- **Binder Content @ Max. Stability:** 4.4
- **Binder Content @ Opt. Air Voids:** 6.4
- **Max. Theoretical @ Optimum:** 100
- **PG Grade by Proposal:** PG 64-22
- **Virgin Binder Grade:** PG 58-28
- **Binder Supplier:** Shelly-Cleveland
- **Polymer Type (SBR or SBS):**
  - **Mixing Temperature:** 290°F
  - **Compaction Temperature:** 275°F
  - **F/A Ratio:** 0.5
  - **50-30 Ratios:** 0
  - **TSR:** NA

**NOTES:**  
- **Lab No:** 20150066 COC

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### Coarse Aggregate

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<tbody>
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<td>GR / LS</td>
<td>Shelly Materials-Columbus, OH (Pugmilt)</td>
<td>45028-01</td>
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### Fine Aggregate

<table>
<thead>
<tr>
<th>% Size</th>
<th>Type</th>
<th>Producer/Location</th>
<th>Code</th>
<th>ODOT Grd</th>
</tr>
</thead>
<tbody>
<tr>
<td>16</td>
<td>Sand</td>
<td>Natural</td>
<td>Mar Zane-Zanesville, OH</td>
<td>04416-01</td>
</tr>
<tr>
<td>15</td>
<td>Sand</td>
<td>Limestone</td>
<td>Shelly Materials-Columbus, OH</td>
<td>04502-01</td>
</tr>
</tbody>
</table>

**RAP & Shingles**

<table>
<thead>
<tr>
<th>% AC</th>
<th>Type</th>
<th>Source</th>
<th>Composition</th>
<th>%e</th>
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<td>5.50</td>
<td>Composite 15-Fine Rap</td>
<td>Limestone</td>
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<td>4</td>
<td>18.00</td>
<td>Pit 90 Shingles</td>
<td>Shingles</td>
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**AVG:** 9.07

*If RAP taken from State route, enter State route and project. If other recycled material, or RAP taken from non-State route, enter size, type and source/location of fine and coarse aggregate, and source of information.

**Band Grd:** 2.591

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### For Official Use Only

**AT OPTIMUM AC CONTENT:**

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<th>Original Rc'd:</th>
<th>Resubmit Rc'd:</th>
<th>Air Voids</th>
<th>VMA</th>
<th>UnitWt</th>
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**Maximum Theo. Stability Flow**

<table>
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<th>Opt. At Median Air Voids?</th>
<th>2 Points Above and Below Opt.?</th>
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**Date Approved:** JMF  
**Calibration #:**

---

**THE CITY OF COLUMBUS**  
ANDREW J. GINThER, MAYOR  
DEPARTMENT OF PUBLIC SERVICE
Mix Design

• All mix designs (three) included 4% of the max 5% RAS by dry unit weight

• Mix designs used between 9 and 10 % RAP in each mix

• RAS was pre-blended with the RAP prior to incorporating into the mix
Plans- RECLAIMED ASPHALT SHINGLES (RAS)

• GEORGESVILLE ROAD

• ITEM 448 ASPHALT CONCRETE SURFACE COURSE (HEAVY TRAFFIC) PG70-22M, RAS, AS PER PLAN (1.5”) - AT THE LOCATIONS SPECIFIED, USE CITY OF COLUMBUS CMS 448 MIX PRODUCED WITH RECLAIMED ASPHALT SHINGLES (RAS) MANUFACTURING WASTE ONLY AT NOT LESS THAN 4% AND UP TO 5.0% RAS PER DRY WEIGHT OF MIX AND PER ODOT 401.04; TABLE 401.04-1. RAP MAY BE USED WITH THE RAS PER ODOT 401.04 WITH A TOTAL RECLAIMED PRODUCT NOT MORE THAN 20%. ENSURE MANUFACTURING WASTE RAS COMES FROM APPROVED ODOT QCP SOURCES. IT SHALL BE UNDERSTOOD THAT THE RAS AND RAP 448 ASPHALT CONCRETE MATERIALS USED AT THE SPECIFIED LOCATIONS FOLLOW ODOT 401.04 FOR THE RAS AND RAP ADIMIXTURES ONLY.
Plans- RECLAIMED ASPHALT SHINGLES (RAS)

- WEBER ROAD

- ITEM 448 ASPHALT CONCRETE SURFACE COURSE (MEDIUM TRAFFIC) PG70-22M, RAS, AS PER PLAN (1.5”) - AT THE LOCATIONS SPECIFIED, USE CITY OF COLUMBUS CMS 448 MIX PRODUCED WITH RECLAIMED ASPHALT SHINGLES (RAS) MANUFACTURING WASTE ONLY AT NOT LESS THAN 4% AND UP TO 5.0% RAS PER DRY WEIGHT OF MIX AND PER ODOT 401.04; TABLE 401.04-1. RAP MAY BE USED WITH THE RAS PER ODOT 401.04 WITH A TOTAL RECLAIMED PRODUCT NOT MORE THAN 20%. ENSURE MANUFACTURING WASTE RAS COMES FROM APPROVED ODOT QCP SOURCES. IT SHALL BE UNDERSTOOD THAT THE RAS AND RAP 448 ASPHALT CONCRETE MATERIALS USED AT THE SPECIFIED LOCATIONS FOLLOW ODOT 401.04 FOR THE RAS AND RAP ADIMIXTURES ONLY.
Plans - RECLAIMED ASPHALT SHINGLES (RAS)

- RESIDENTIAL STREETS
- ITEM 448 ASPHALT CONCRETE SURFACE COURSE (MEDIUM TRAFFIC) PG64-22, RAS, AS PER PLAN (1.25”) - AT THE LOCATIONS SPECIFIED, USE CITY OF COLUMBUS CMS 448 MIX PRODUCED WITH RECLAIMED ASPHALT SHINGLES (RAS) MANUFACTURING WASTE ONLY AT NOT LESS THAN 4% AND UP TO 5.0% RAS PER DRY WEIGHT OF MIX AND PER ODOT 401.04; TABLE 401.04-1. RAP MAY BE USED WITH THE RAS PER ODOT 401.04 WITH A TOTAL RECLAIMED PRODUCT NOT MORE THAN 20%. ENSURE MANUFACTURING WASTE RAS COMES FROM APPROVED ODOT QCP SOURCES. IT SHALL BE UNDERSTOOD THAT THE RAS AND RAP 448 ASPHALT CONCRETE MATERIALS USED AT THE SPECIFIED LOCATIONS FOLLOW ODOT 401.04 FOR THE RAS AND RAP ADIMIXTURES ONLY.
RAS Asphalt Placement Areas

Legend
- 2015_P1: COMMUNITY PLANNING AREA (R.A.S.)
RAS Asphalt Placement Areas

• Reviewed the streets being resurfaced on Resurfacing 2015 P-1

• Recommended RAS streets to maximize the widest range of traffic types

• Selected areas with previous pavement rutting to observe future pavement performance
  
  – Arterial Streets (heavy truck and bus use)
  – Collector Streets (routine bus use)
  – Residential Streets (light traffic)
Side by side comparison of performance

• For each location chosen it was important to place both the RAS asphalt and convectional mix in areas that would receive nearly identical traffic and loading

• It was also important to choose placement volumes and locations to provide a constructible project

• The contractor was allowed to propose modifications to placement areas to make the project more constructible while still providing an apples to apples comparison of the mixes with similar traffic
RAS Asphalt Quantities Placed

• Georgesville Rd. RAS quantities PG70-22M Heavy RAS (1.5”)
  – 1069.77 C.Y.

• Weber Rd RAS quantities PG70-22M Medium RAS (1.5”)
  – 351.68 C.Y.

• Residential street RAS quantities PG64-22M Medium RAS (1.25”)
  – 272.59 C.Y.

• Total 1694 C.Y. - approx. 3400 tons
Expectations

• Reduced rutting and deformation on heavy traffic areas

• Reduced cracking on all streets where RAS asphalt is used throughout the project

• Improved life cycle costs (maintenance and resurfacing frequency)

• Improved sustainability through increased recycling and reduction in natural resource consumption and waste diversion from landfills
Future Considerations for RAS use

• Continued monitoring proves successful
  – Supplemental Specification 1100

• 3400 tons placed at 4% RAS = 140 tons of shingles kept out of landfills

• COC current annual resurfacing program just under $30 million
  – Places approx. 55,000 C.Y. or 110,000 tons of asphalt
    – @ 4% RAS = 4400 tons of shingles
    – @ 6% RAS = 6600 tons of shingles
    – @ 8% RAS = 8800 tons of shingles
Columbus always looking for innovative solutions

• The City of Columbus continues to emphasize *Green* and sustainable solutions to be incorporated into projects

• In 2016, Columbus will perform a similar pilot in conjunction ODOT’s Research Initiative for Locals (ORIL) and Ohio University to test the use of Ground Tire Rubber (GTR) in asphalt

• Columbus will also pilot the use or Aramid Fibers to prevent reflective cracking, reduce the total impact traffic, and decrease necessary pavement build-up.
Acknowledgements:

• Ohio EPA
• Flexible Pavements of Ohio
• Shelly Company
• Strawser Paving Company
• Ohio Department of Transportation
• City of Columbus Design Section
• ShingleRecycling.org
• National Asphalt Paving Association
Questions?