Flexible Pavement of Ohio

49th Annual Meeting & Equipment Exposition
Wednesday, March 9, 2011
Doug Davis, P.E., P.S.
Muskingum County Engineer
Zanesville, Ohio
Roads are living and breathing organisms.
In what condition are our roads?

- **Asphalt** – MUS- 272 Miles
  - Sub-base condition
  - Raveling, Alligator Cracking, Transverse Cracking

- **Chip-Seal** – MUS- 210 Miles
  - Exposed aggregate or mud pumping
  - Washboards, cracking, rutting

- **Stone** – MUS- 47 Miles
  - Washboards
Solutions to problems

• If roads have problems, three factors will ultimately determine their longevity…
  – The Right Treatment…
  – On the Right Road…
  – At the Right Time.
  – vs. ADT

WHAT DOES THIS MEAN?
The right treatment...

• Asphalt
  – What kind of mix should be used?
  – How does ADT and flexibility factor into it?

• Chip-Seal
  – What type of stone and emulsion rate was used on last application?
  – Damaged areas: Cold mix patch? Durapatcher?

• Stone
  – Grader?
  – What type of stone…river gravel, limestone?
The right treatment...

• The right treatment does include more than road surface conditions.
  
  – Ditching…where is the water going?
  – Trees…is the sunlight getting to the road?
  – Culverts…are ditches moving water through these?
The right road…

• Pavement Condition Rating (PCR) system
  – How do the roads score?
• Patching & Repairs
  – Prioritize
  – Preservation
• Residential vs. commercial usage
• What surface does the road currently have?
  – Material selection based on usage and current PCR
Pavement Condition Rating (PCR)
Pavement Condition Rating (PCR)

MCEO
Pavement Condition Rating

Road: __________________________ Rating Technician: __________________________
Section: _________________________ Date: __________________________

0-5 Rating Scale (Note: "0" indicates defect does not occur, "5" means defect occurs frequently)

<table>
<thead>
<tr>
<th>DEFECTS</th>
<th>RATING</th>
</tr>
</thead>
<tbody>
<tr>
<td>Potholes/Patching (0-5)</td>
<td></td>
</tr>
<tr>
<td>(breaks in pavement or patched areas)</td>
<td></td>
</tr>
<tr>
<td>Edge Cracking (0-5)</td>
<td></td>
</tr>
<tr>
<td>(cracks along road surface edge before berm)</td>
<td></td>
</tr>
<tr>
<td>Transverse/Alligator Cracking (0-5)</td>
<td></td>
</tr>
<tr>
<td>(cracking across traveling surface)</td>
<td></td>
</tr>
<tr>
<td>Rutting/Corrugations (0-5)</td>
<td></td>
</tr>
<tr>
<td>(depressions or undulations that cause valleys and crests to form in the pavement)</td>
<td></td>
</tr>
<tr>
<td>Surface Wearing/Raveling (0-5)</td>
<td></td>
</tr>
<tr>
<td>(disintegration of surface displaying loose aggregate and/or polished aggregate)</td>
<td></td>
</tr>
<tr>
<td>Base Failure/Shoving (0-5)</td>
<td></td>
</tr>
<tr>
<td>(bumps, dips, pumping caused by underlying failure below road surface)</td>
<td></td>
</tr>
</tbody>
</table>

TOTAL RATING __________

Comments: ____________________________________________
The right time…

• What time of year is best to apply:
  – Chip-seal?
    • For leveling and sealing cracks on roadways.
  – Asphalt?
  – Cold mix or other patching methods?
  – Concrete
  – Culvert Pipe
The right time…

- Is potential growth in the near future?
  - What kind of growth?
- Will any utilities be upgrading services within the right-of-way?
- When will the striping be performed?
  - Leave enough time for proper application
<table>
<thead>
<tr>
<th>ADT</th>
<th>Miles</th>
<th>% of 272 miles</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt; 6,000</td>
<td>11.56</td>
<td>4.25%</td>
</tr>
<tr>
<td>5,000-6,000</td>
<td>4.58</td>
<td>1.68%</td>
</tr>
<tr>
<td>4,000-5,000</td>
<td>0.28</td>
<td>0.10%</td>
</tr>
<tr>
<td>3,000-4,000</td>
<td>9.6</td>
<td>3.53%</td>
</tr>
<tr>
<td>2,000-3,000</td>
<td>21.87</td>
<td>8.04%</td>
</tr>
<tr>
<td>1,000-2,000</td>
<td>50.71</td>
<td>18.64%</td>
</tr>
<tr>
<td>&lt; 1,000</td>
<td>173.14</td>
<td>63.65%</td>
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</table>
448-Type 1 Asphalt Concrete

- 448-Type 1 is primarily used on high ADT roads with a good sub-base.
- 3,000-6,000+ ADT
- From 2005-2007, MCEO used 448-Type 1.
- Provides great scratching and bridging material.
- It has been discovered that on county roads that have sub-base movement or damage, the 448-Type 1 is not as flexible as is needed.
  - Freeze and thaw wreck havoc on unstable sub-bases.
448-Type 1 Asphalt Concrete

• Although 448-Type 1 is often cheaper per ton than its alternatives, a depth of 1 ½” to 2” must be maintained for effectiveness.
• As costs rise, MCEO was searching for a pavement that can be applied in a thinner lift and pave more miles, while still maintaining a high level of durability for about the same amount of money as 448-Type 1.

• From 2008-2009, MCEO began to apply…..
441-Polymer Asphalt Concrete

- 441-Polymer can be applied to a roadway in 1 ¼” lifts.
- Although more expensive per ton, 441-Polymer gives the road surface greater flexibility.
- 441-Polymer can be applied to roadways under 6,000 ADT.
  - Has been very stable since its application.
  - Less repairs.
MCEO will continue to use the 441-Polymer in conditions that require flexibility with larger volumes of traffic.

- Diminishes rutting.
- Alligator cracking will appear.
Asphalt Concrete

• A high percentage (64%) of Muskingum County asphalt roadways are less than 1,000 ADT.

• MCEO was looking for an asphalt material with similar durability as 441-Polymer but could be applied at more tons per mile.

• 441-Polymer can be applied to roads with less than 1,000 ADT, but it is not as cost effective than the asphalt used in 2010 by MCEO……..
404-LVT Asphalt Concrete

404-LVT has been designed to be rich in asphalt binder, fine textured, and non-restrictive in aggregate shape; this facilitates attaining mix density, flexibility, and resilience.

These are necessary properties for ensuring longevity and successful mix performance on low volume roadways where oxidation and cracking are the primary pavement distresses.

Since 404-LVT is a recipe mix it should only be used for routes having ADT<2,500.
**404-LVT Asphalt Concrete**

- It’s all about the numbers...
  - 404-LVT is in line to make a large return in comparison to Type 448 at an increased thickness.
  - Roads suited for the 404-LVT will allow entities to stretch their funding and add more mileage annually.

- The reasoning for this is............
404-LVT Asphalt Concrete

- The roads with 2,500 ADT or less can stand up against rutting and surface wear.
- Restoring ride quality
- Improving safety
  - Increase skid resistance and resist aggregate delamination.
404-LVT Asphalt Concrete

• You know you need 404-LVT if...
  ▪ no structural damage
  ▪ no appreciable rutting (< ¼ inch) at 1” laid,
  ▪ sufficient pavement structural capacity to last the life of the 404-LVT overlay.
404-LVT Asphalt Concrete

MCEO
Asphalt Comparison

Asphalt Concrete Material
A  448 Asphalt Concrete, Type 1 Medium, PG76-22 GTR (Ground Tire Rubber Asphalt)
B  448 Asphalt Concrete, Type 1 & 2, Surface Course, PG 64-22
C  441 Asphalt Concrete, Type 1 Medium, PG 70-22M, Polymer Asphalt Binder
D  404 LV (Low volume) Asphalt Concrete, PG 64-22

*Type awarded

<table>
<thead>
<tr>
<th>Year Improved</th>
<th>Project</th>
<th>Asphalt</th>
<th>Thickness (in.)</th>
<th>Tons Bid</th>
<th>Cost per ton</th>
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</thead>
<tbody>
<tr>
<td>2005</td>
<td>Various Rds</td>
<td>B*</td>
<td>1.50</td>
<td>18,449.00</td>
<td>$36.50</td>
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<tr>
<td>2006</td>
<td>Various Rds</td>
<td>B*</td>
<td>1.50</td>
<td>11,308.00</td>
<td>$47.00</td>
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<tr>
<td>2007</td>
<td>Various Rds</td>
<td>B</td>
<td>1.50</td>
<td>9,464.00</td>
<td>$51.50</td>
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<tr>
<td>2007</td>
<td>Various Rds</td>
<td>C*</td>
<td>1.25</td>
<td>7,874.00</td>
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<td>2007</td>
<td>MUS-CR87</td>
<td>B*</td>
<td>3.00</td>
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<td>$50.00</td>
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<tr>
<td>2007</td>
<td>MUS-CR408</td>
<td>B*</td>
<td>3.00</td>
<td>12,258.00</td>
<td>$52.00</td>
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<td>2008</td>
<td>Various Rds</td>
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<td>20,178.00</td>
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<td>2008</td>
<td>Various Rds</td>
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<td>$65.00</td>
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<tr>
<td>2008</td>
<td>MUS-CR7</td>
<td>B*</td>
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<td>10,112.00</td>
<td>$56.00</td>
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<tr>
<td>2009</td>
<td>Various Rds</td>
<td>B</td>
<td>1.50</td>
<td>19,394.00</td>
<td>$63.50</td>
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<td>2009</td>
<td>Various Rds</td>
<td>C*</td>
<td>1.25</td>
<td>16,136.00</td>
<td>$73.75</td>
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<tr>
<td>2009</td>
<td>MUS-CR600</td>
<td>A*</td>
<td>2.00</td>
<td>8,068.00</td>
<td>$85.75</td>
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<tr>
<td>2010</td>
<td>Various Rds</td>
<td>D*</td>
<td>1.00</td>
<td>19,842.00</td>
<td>$69.00</td>
</tr>
</tbody>
</table>
# 404-LVT Asphalt Concrete

## Muskingum County – 2010 Costs

<table>
<thead>
<tr>
<th>Type</th>
<th>PG</th>
<th>Cost per Ton</th>
<th>Thickness (in.)</th>
<th>Tons per Mile</th>
<th>Cost per Mile</th>
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</thead>
<tbody>
<tr>
<td>448</td>
<td>6422</td>
<td>$64.00</td>
<td>1.50</td>
<td>977.78</td>
<td>$62,577.92</td>
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<tr>
<td>441</td>
<td>7022</td>
<td>$74.00</td>
<td>1.25</td>
<td>814.81</td>
<td>$60,295.94</td>
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<tr>
<td>404</td>
<td>6422</td>
<td>$69.00</td>
<td>1.00</td>
<td>651.85</td>
<td>$44,977.65</td>
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*Width = 20’  *1 mile  *Conversion Factor = 2
Questions ?