The Basics: What Interlayers are, and Why We Use them

What are Interlayers?

Interlayers ≠ Pavement Reinforcement Products

Why are Interlayers Used?

To get more life out of your pavement, at a lower cost, over the course of its life
Building Longer Life, More Maintenance Free HMA Pavements, that Cost Less

OR JUST KEEP MAINTAINING!

When Aren’t Interlayers be Enough?

What Can be Done Instead?

STRUCTURAL – Base Issue CORRECTION

Problems that Pavement Reinforcement Products Solve / Benefits they Bring
Benefits Of Pavement Reinforcement Products

- Reinforcement
- Mitigate Reflective Cracking
- Moisture Barrier
- Sustainability

Reinforcement Matters

1. Structural Reinforcement

Continuous high tensile, pre-coated high temp. with elastomeric polymer, fiberglass is to asphalt as steel rebar is to concrete

Fiberglass has a modulus advantage over the asphalt and is not water/temperature sensitive

REINFORCEMENT MATTERS!

No Reinforcement  Reinforced with GlasGrid TF

Over 6.5 Times Longer

Maximum Load Distribution

Load distribution is one of the primary functions of a pavement

Conventional Pavement Load Distribution Curves

Maximum Load Distribution

Load distribution is one of the primary functions of a pavement

More Cost Effective and Higher Performing HMA Pavements

Most Efficient Pavement Load Distribution Curves

Equivalent LOAD Design with Reinforcement

AASHTO Design to Increase Load Capacity

1. HMA section must be critical layer
2. Must be placed in the tension zone of the pavement
2. Crack Relief

High tensile rebar-type reinforcing + Low tensile HMA = Crack Resistant Pavements
Mitigate Moisture Intrusion

Interlayer Creates Moisture Barrier
Seals Cracks To Keep Water Out of Base
Preserves Load Bearing Capacity

Graph: “Straws from an interlayer create a moisture barrier to stop top down moisture intrusion.”

Sustainability

Plus Sustainable practices

Must be completely Millable PLUS must be Recyclable back into a new HMA up to 30% with no detriment to that mix

Rebar Type Reinforcement for HMA

Key Points

Design and Construct HMA Pavements that:

1. have 2X load capacity (ESALs)
2. delayed crack return 3, 6 or 9X longer
3. preserved base structure by keeping top down water out of the base

Plus be completely millable and recyclable

High temperature pre-coated, high tensile, continuous fiberglass rebar type reinforcement in HMA can!

How Flexible Pavements Fail

Source: MODOT youtube site

Independent Verification & Project Examples
In 2007, the City and County of Honolulu rehabilitated the streets on Alewa Drive, Unit 49. Various rehabilitation strategies were installed based on the condition of the streets.

After 12 years of trafficking, the following pictures compare the performance of the reinforced asphalt sections underlain by Tensar GlasGrid compared to asphalt sections without GlasGrid. The asphalt reinforced with GlasGrid is currently providing a superior performance (i.e. less cracks on the surface and improved International Roughness Index) compared to asphalt sections without GlasGrid.
Influence of GlasGrid® on Asphalt Pavement Performance.

• NCAT Ongoing full scale research
• 2018 Update: 18 years and 60 million ESAL’s of accelerated traffic loading

Performance Update 2018

Performance Validation

2018 Unreinforced Section: Cracking first observed in 2006. Mainline fatigue cracks in addition to cold joint crack.
GlasGrid Reinforced Section after 60 Mil ESALs and 18 Yrs.
2018 Still no cracks in mainline only at cold joint

Performance Validation

Full Scale in-place testing
The improvement factor is typically in the range of 2-5, and represents the reinforcing benefit of the interlayer. This factor can be used in Mechanistic Empirical design, and applied to the result of the transfer function.

Performance Validation

APT

Fatigue Cracking Section C With GlasGrid 8511
Vs
Section D with NO GlasGrid

Performance Validation

APT

In-Place Plate Load Validation Testing

This test with this pavement structure the GlasGrid TF reinforced slabs have a structural contribution that is 2 times stronger than that of the control slab. This structural improvement can be applied to the AASHO SN equation to determine what the contribution of the GlasGrid TF is to the layer coefficient.
Performance Validation
In-Place Validation Testing

4 Point Strain Controlled Beam Test

GlasGrid TF Structural contribution 2 times stronger than the control

Proper High Temperature Coated, High Tensile, Low Elongating, Continuous Rebar type Reinforcement will:

- Reinforce to add LOAD Capacity
- Delay cracks and their severity
- Waterproof to preserve base

Cost by HMA Reinforcement Type

<table>
<thead>
<tr>
<th>HMA Pavement ESAL Increase Worksheet</th>
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</thead>
<tbody>
<tr>
<td>Project Name: HMA Pavement ESAL Increase Worksheet</td>
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<tr>
<td>ESAL Increase: 0.22</td>
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<tr>
<td>SN: 0.11</td>
</tr>
<tr>
<td>SN Range: 0.08-0.14</td>
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</tbody>
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Take Away:

With Increased ESAL capacity, Delayed Cracks and a Dry Foundation we can:

1. More rapidly improve network PCI
2. Reduce maintenance cost and intervals
3. Less downtime, work zones, liability
4. Better Ride, Better looks, longer

Let us Help You Design & Build More Maintenance free Pavement Structures that Last Longer and Cost Less
### Sample AASHTO Design:

#### REHAB: Unreinforced HMA

<table>
<thead>
<tr>
<th>Mill Thickness</th>
<th>Layer Thickness</th>
<th>ai</th>
<th>mi</th>
<th>SN</th>
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</thead>
<tbody>
<tr>
<td>New HMA</td>
<td>5.5</td>
<td>0.44</td>
<td>2.42</td>
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<tr>
<td>ABC</td>
<td>10.5</td>
<td>0.11</td>
<td>1</td>
<td>1.10</td>
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<tr>
<td>Total</td>
<td>16</td>
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<td>3.52</td>
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<td><strong>ESAL</strong></td>
<td><strong>614,698</strong></td>
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<tr>
<td><strong>TI</strong></td>
<td><strong>8.49</strong></td>
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</table>

#### REHAB: New HMA + GlasPave50 Reinforcement - HMA

<table>
<thead>
<tr>
<th>Mill Thickness</th>
<th>Layer Thickness</th>
<th>ai</th>
<th>mi</th>
<th>SN</th>
</tr>
</thead>
<tbody>
<tr>
<td>HMA+GGTF + GL</td>
<td>5.5</td>
<td>0.66</td>
<td>2.64</td>
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<tr>
<td>LvLup HMA</td>
<td>1.5</td>
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<td>0.66</td>
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<tr>
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<td>0.11</td>
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<td>1.16</td>
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<tr>
<td>Total</td>
<td>16</td>
<td></td>
<td></td>
<td>4.46</td>
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<tr>
<td><strong>ESAL</strong></td>
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<td></td>
<td></td>
<td></td>
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<tr>
<td><strong>TI</strong></td>
<td><strong>10.22</strong></td>
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#### REHAB: Unreinforced HMA

<table>
<thead>
<tr>
<th>Mill Thickness</th>
<th>Layer Thickness</th>
<th>ai</th>
<th>mi</th>
<th>SN</th>
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</thead>
<tbody>
<tr>
<td>HMA + GGTF</td>
<td>4</td>
<td>0.66</td>
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<td>HMA</td>
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<td>0</td>
<td></td>
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<tr>
<td>ABC</td>
<td>9.5</td>
<td>0.105</td>
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<td>1.00</td>
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<tr>
<td>Total</td>
<td>16</td>
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<td>4.46</td>
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<tr>
<td><strong>ESAL</strong></td>
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<td><strong>10.22</strong></td>
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### Sample Design Results:

#### Performance Comparison

<table>
<thead>
<tr>
<th></th>
<th>Existing</th>
<th>GGTF Reinforced</th>
<th>GP Reinforced</th>
<th>Unreinforced</th>
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<tbody>
<tr>
<td>Structure Number</td>
<td>2.14</td>
<td>4.40</td>
<td>4.40</td>
<td>4.41</td>
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<td>ESAL's</td>
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<tr>
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<td><strong>10.22</strong></td>
<td><strong>10.23</strong></td>
</tr>
</tbody>
</table>

### Improvement Factor vs No Reinforcement (Traffic Benefit Ratio):

- **4.7**
- **2.5**
- **–**

### Added inches of HMA needed to Achieve Same Performance:

- **2.7**
- **0**
- **2.7**

### Added Crack Delay compared to no Reinforcement:

- **9X**
- **6X**
- **Min.**

### Waterproof membrane to keep base dry:

- YES
- NO
- NO

### RAP containing GG/GP can be added back into a new mix up to 30%:

- YES
- YES
- –

### Cost Benefit Analysis

<table>
<thead>
<tr>
<th></th>
<th>Added Cost of Paving Reinforcement (per SY):</th>
<th>Cost of HMA Installed (per SY):</th>
<th>Total Cost Installed (SY):</th>
<th>Percent Cost Savings vs Equivalent Asphalt:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Implanted</td>
<td>$15.95</td>
<td>$52.66</td>
<td>$68.61</td>
<td>–12%</td>
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<tr>
<td>Cost of HMA</td>
<td>$45.92</td>
<td>$59.64</td>
<td>$105.56</td>
<td>–2%</td>
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<tr>
<td>Total Cost</td>
<td>$60.82</td>
<td>$66.64</td>
<td>$171.48</td>
<td>–</td>
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### Questions?

Thank You

Jordan Rabin
Engineering Rep for Pacific North – ID, OR, WA
Jrabin@Tensarcorp.com
206-518-2318

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### INSTALLATION

#### Placing HMA Reinforcement

#### GlasGrid TF Installation

#### GlasGrid GlasPave Installation
PatchGlas 100/25 Installation

▲ Rubber tire roll in-place to assure adhesion ▼

◄ PREP: Mill, Prime, Level-Up

Unroll and remove release film ▼

PatchGlas 100/25 Installation

Rubber tire roll in-place to assure adhesion