With today’s rapidly aging infrastructure, government agencies, bitumen producers and contractors are being challenged to build longer-lasting roads with technologies that not only perform well, but are also cost-effective and operationally efficient, while ensuring worker comfort and safety. Traditional anti-strips do not fully address these challenges. Many traditional liquid anti-strips help pavements last longer, but when added to bitumen, most emit smoke and foul-smelling fumes that are uncomfortable for plant and paving crew personnel as well as citizens. Moreover, these liquid anti-strips pose operational challenges since they are incompatible with some bitumen modifiers. While hydrated lime can extend pavement life, it poses serious health hazards to workers exposed to caustic dust that can be generated during handling.

Road Science’s NovaGrip line of next-generation liquid anti-stripping additives fully addresses today’s challenges. NovaGrip safeguards workers from the hazards of traditional anti-strips by using chemistry that is less hazardous and safer for workers, while eradicating the smoke, odor and dust problems typical of traditional additives. NovaGrip’s adhesion promoting technology makes roads last longer by creating powerful chemical bonding between bitumen and aggregate that lasts even with prolonged exposure to water. Additionally, NovaGrip additives add operational flexibility to the bitumen terminal or mix plant since they are compatible with all bitumen modifiers.

**SAFER & WORKER-FRIENDLY**
- Safer chemistry poses fewer health hazards and risks to workers
- Odorless in hot bitumen for improved plant and paving crew comfort
- Smokeless in hot bitumen eradicating the need for vapor control equipment and eliminating worker and citizen complaints
- Non-hazardous and non-regulated transport option available, offering the highest worker safeguards possible while reducing compliance and logistics costs

**IMPROVED OPERATIONAL EFFICIENCY**
- Compatible with polyphosphoric acid (PPA)
- Eliminates need to have more than one additive at terminal or mix plant
- Compatible with all aggregate types
- Improves mix workability for easier handwork
- Remains effective in bitumen stored at 160 °C for several weeks to months

**LONGER-LASTING ROADS**
- Extends pavement life by promoting better chemical adhesion of bitumen to aggregate
- Protects pavement from stripping and moisture damage caused distresses such as raveling, rutting and pothole formation
MARKET APPLICATIONS

BITUMEN PAVING USING:
- Non-modified bitumens
- Modified bitumens including those modified with:
  - Polycarboxylic acid (PPA)
  - Styrene-butadiene-styrene (SBS)
  - Styrene-butadiene rubber (SBR)
  - Ethylene-vinyl acetate (EVA) polymers
  - Ground tire rubber (GTR)

AGGREGATE TYPES INCLUDING:
- Granite
- Diabase
- Diorite
- Basalt
- Gabbro
- Rhyolite
- Andesite
- Dacite
- Chert
- Marble
- Quartzite
- Gneiss
- Natural Sand and Gravel
- Limestone
- Dolomite
- Sandstone
- Slag
- Recycled Asphalt Pavement (RAP)

NOVAGRIP VS. TRADITIONAL ANTI-STRIPS

<table>
<thead>
<tr>
<th>Comparison Criteria</th>
<th>Traditional Anti-Strips</th>
<th>NovaGrip D-750 EU</th>
<th>NovaGrip D-761 EU</th>
<th>NovaGrip D-771 EU</th>
</tr>
</thead>
<tbody>
<tr>
<td>Safe for workers</td>
<td></td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
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<tr>
<td>Odorless</td>
<td></td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Smokeless</td>
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<td>✓</td>
<td>✓</td>
<td>✓</td>
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<tr>
<td>Compatible with PPA modified bitumen</td>
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<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Protects against moisture damage</td>
<td></td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Improves mix workability</td>
<td></td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
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<tr>
<td>Efficacy with prolonged storage in bitumen</td>
<td></td>
<td>✓</td>
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<td>✓</td>
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<tr>
<td>No heated storage required</td>
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<td></td>
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<tr>
<td>Passes adhesion tests with most challenging bitumen and aggregate combinations</td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Non-hazardous</td>
<td></td>
<td></td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Non-regulated for transport</td>
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</tbody>
</table>

THE ROAD SCIENCE ADVANTAGE

ArrMaz’s Road Science division is a leader in the development of bitumen additives, emulsifiers, and paving and recycling system technologies for the bitumen industry worldwide. Our offerings span the entire customer value chain from producing key chemical components for bitumen refineries, terminals, emulsion plants and hot mix bitumen plants, to providing laboratory and field engineering support of pavement applications. Road Science delivers responsive, comprehensive and dependable customer support focused on helping our customers succeed. Through our experienced staff of professionals and world-class AASHTO Materials Reference Laboratory (AMRL) accredited laboratory, we work alongside our customers to:

- Improve product quality and consistency
- Improve product performance
- Bring new products to market
- Solve product problems
- Increase profitability
- Increase operational efficiency

Contact Road Science today and learn how NovaGrip can help you make the grade. Call 918-960-3800, email customerservice@roadscience.net or visit our website at roadscience.net for further information.

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