Red Bus Lane Treatment Evaluation

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I. Background: why red bus lanes?

II. NYCDOT experience with red bus lane treatments

III. Field and lab testing methodology and results

IV. Recommendations for practitioners
Why Red Bus Lanes?

• Part of NYC’s BRT tool box; in use since 2007
• Visual cue to drivers to obey bus lane rules
• Reduces unauthorized bus lane use, esp. illegal standing/parking
• No negative impacts on non-bus driver behaviors
NYCDOT Experience with Red Bus Lane Treatments
Red Bus Lane
Treatment Goals

• Agency goals:
  – High visibility
  – Durability - at least 3 years
  – Safety - adequate skid resistance
  – Low cost
  – Ease of installation
  – Ease of patching – utility cuts

• Initial product selected
  – Epoxy street paint
Paint on New Asphalt: First Avenue (1 Year)

Epoxy Street Paint – Minimal Surface Prep
First Ave. bet. 15th and 16th St.
Paint on Existing Asphalt: First Avenue (1 year)

Epoxy Street Paint – Minimal Surface Prep
First Ave. bet. 14th and 15th St.
Bus Stops: Special Challenges

34th Street (3 Years)

34th St. EB at Second Ave.
Bus stop location

34th St. bet First & Second Aves.
Non-bus stop location
Adhesion to AC Surfaces

• Epoxy street paints applied to new asphalt last 3-5 years without failing.
• Epoxy street paints applied to existing asphalt typically fail in less than one year.
• Epoxy street paints wear faster at bus stop locations.
• Epoxy street paints applied to new asphalt at bus stops will likely fail in two to three years.
Paint on Concrete: Fordham Rd (1 year)

West 207th St. at Tenth Ave.

Fordham Rd. in the vicinity of Sedgwick Ave.
Microsurfacing on Concrete: First Avenue (9 Months)

First Ave. bet 88th and 89th St.
Adhesion to Concrete Surfaces

• Red-paint products applied to existing concrete surfaces will fail in six months to one year.
• Portland cement-based micro surfaces applied to existing concrete roadways will fail in six months to one year.
• Existing concrete roadways present a particularly difficult challenge when applying a red treatment for a bus lane.
Red Lane Product
Field and Lab Testing
Methodology and Results
April 2010 - NYCDOT issued a request for expressions of interest (RFEI) to red lane product manufacturers.

Purpose - to identify potential red lane products and application solutions that might be right for NYC.

Testing - DOT received 8 responses and invited 6 manufacturers to participate in lab and field testing.

Study Team - Lab and field testing conducted in partnership with the Pennsylvania State University.
## Products Tested

<table>
<thead>
<tr>
<th>Product ID</th>
<th>Product Type</th>
<th>Field Test</th>
<th>Lab Test</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Red Epoxy Street Paint, Brand A</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>2</td>
<td>Red Epoxy Street Paint, Brand B</td>
<td>Yes</td>
<td>Yes</td>
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<td>3</td>
<td>Epoxy with Red Aggregate (anti-skid), Brand B</td>
<td>Yes</td>
<td>No</td>
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<td>4</td>
<td>Epoxy with Red Aggregate (anti-skid), Brand C</td>
<td>Yes</td>
<td>Yes</td>
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<td>5</td>
<td>Red MMA with Aggregate (anti-skid), Brand D</td>
<td>Yes</td>
<td>Yes</td>
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<td>6</td>
<td>Red-Tinted Portland Cement Micro Surface, Brand E</td>
<td>Yes</td>
<td>Yes</td>
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<td>7</td>
<td>Red-Tinted Portland Cement Micro Surface, Brand F</td>
<td>Yes</td>
<td>Yes</td>
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<td>8</td>
<td>Red Asphalt Concrete Micro Surface, Brand G</td>
<td>Yes</td>
<td>Yes</td>
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<tr>
<td>9</td>
<td>Chip Seal with Red Binder, Brand G</td>
<td>Yes</td>
<td>No</td>
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Field Test Methodology

- DOT identified eight test patches on the Third Avenue bus lane between 36th and 42nd Streets
- Asphalt in good condition with a high volume of bus traffic during weekdays
- Manufacturers applied their product(s) to their assigned test patch in October 2010
- Durability and friction testing performed immediately after October 2010 application and again in April 2011
Team determined percentage of product remaining after six months

- Total Picture Area: 512x512=262,144 pixels
- Color Covered Area: 200,618 pixels
- Uncovered Surface Area: 61,526 pixels

Percent Coverage: 76.53%
- Team determined coefficient of friction
- Plot of friction vs. slip speed

Source: Hall et al., NCHRP Web-only Document 108 (2009)
• Prepared eight 2.5’ by 2.5’ AC test slabs using DOT AC mix
• Manufacturers applied their products to a designated slab
• Team measured product coverage (100%) and skid resistance
Accelerated Wear Testing

• Slabs were subjected to accelerated traffic wear using Model Mobile Load Simulator (MMLS) at PSU
  – 4 pneumatic rubber tires
  – Preliminary testing with uncoated tires
  – Subsequent testing with silica carbide treatment on two tires
  – Linear motion tire setting (7,200 cycles/hr over 4-ft length)
• Same photo imaging and friction testing as in field test
Sample Field Testing Result

October 2010

April 2011

4.6% Reduction in Coverage

• Notes: product color not bright enough; product exhibited slight deterioration at edges; product texture attracts trash and grime
Edge Deterioration
Sample Lab Testing Result

After 766,800 cycles with uncoated tires

+300,000 cycles with coated tires

<table>
<thead>
<tr>
<th>Cycles</th>
<th>Coverage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Begin</td>
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<tr>
<td>100,000</td>
<td>75.8</td>
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<tr>
<td>200,000</td>
<td>65.7</td>
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<tr>
<td><strong>300,000</strong></td>
<td><strong>29.3</strong></td>
</tr>
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</table>
Lab and Field Testing Results

• The three top performing products:
  – StreetBond CL, a Quest Construction product
  – Mark 177 System, a Dow POLY-CARB product
  – Cape Seal, a New York Bituminous Products Corporation product

• The Portland Cement-based micro surfaces demonstrated inferior durability.

• All products had friction scores at least as high NYC asphalt after six months.
Study Recommendations

• Portland cement-based micro surfaces are not effective as a red bus lane treatment.
• Although durable, products designed as anti-skid treatments tend to attract more dirt and debris.
• Epoxy street paint products provide a durable red bus lane solution for new AC surfaces.
• AC-based micro surfaces are a promising red bus lane treatment for new and existing AC surfaces and should be evaluated further.
• Aggressive pre-treatment, including shot blasting and power washing, appears to improve the performance of epoxy street paints on existing asphalt roadways and should be evaluated further.
Thank You

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