Safety Hardware and Materials for Safer, Forgiving Roadways

*Breakaways for Roadside Signs, Lights and Poles and Color Pavement Marking for Special Use Lanes and Traffic Calming*

Arthur M. Dinitz, Chairman, CEO, Transpo Industries, Inc.
Roadways are now designed with a “forgiving” concept

Still approximately 34,000 fatalities occurred in the US and approximately 1.5 million Worldwide in 2010.

70% of one vehicle fatalities involve cars leaving the roadway and either overturning or colliding with fixed objects.
Hazards drivers encounter:

- Unyielding sign and luminary supports
- Non-traversable drainage structures
- Utility poles
- Trees
- Steep slopes
- Other unforgiving highway hazards such as blunt ends of guardrail and concrete barriers
Breakaways for ground mounted signs and luminaires can significantly decrease the severity of these accidents and resulting fatalities.
NCHRP 350 & MASH 08  
(National Cooperative Highway Research Program & Manual for Assessing Safety Hardware)

Recommended Procedures for the Safety Performance Evaluation of Highway Features

**Ground Mounted Signs & Luminaires**

- Change of Velocity is less than 22 km/hr
- Height of Breakaway Stub - 100mm maximum
- Wind Load Design - 210 km/hr
- Multiple Post Spacing - 2.1m between
The history of breakaways for signs and light posts goes back 50 years in the United States.

- Slip Base
- Omni-Directional Breakaway
  - Frangible Base
  - Frangible Coupling
Sign slip bases work where the vehicle strikes the support in the direction of the traffic (notches). The upper post separates from the imbedded portion. (0-25° angle of impact).
A **frangible** sign post base is designed to “break away” when a vehicle strikes it (Primarily used on small sign posts).

**Omni-directional angle of impact**

Types of Frangible Bases:

- Tear Away
- Stripped Bolt
- Omni-Directional Breakaway (Frangible) Coupling
Frangible coupling sign post bases are designed to “breakaway” when a vehicle strikes it. It is used on small and large sign posts. (Omni-Directional angle of impact)
Breakaways are impact tested using the critical angle of impact

- Slip Base: 0-25 degrees
- Frangible bases: 0-90 degrees
- Frangible couplings: 0-90 degrees
Omni-Directional Breakaway System

90° Pendulum Test
Single Post and Multiple Post Signs

- Ground-Mounted Signs Located within Roadside Clear Zones
- Locations Vulnerable to Vehicular Impacts
Range of Post Sizes

- National signing standards specify increased sizes for visibility & wind loads
- Breakaway systems should have a high structural load-carrying capacity
- Breakaway designs can be used on signs requiring posts up to 53 cm ‘I’ Beams.
Breakaways for Luminaires
Breakaways for Luminaires

- Slip Base
- Transformer Base
- Frangible Couplings
Poles in the Clear Zone

- Light poles
- Traffic monitoring poles
- Weather station poles
- Call box poles
- Residential poles
- Any other roadside pole requiring breakaway support
Breakaways for Luminaires

100 km/hr - 90° Impact
Safety & Structural Requirements

- Designed to support largest pole allowed (450 kg and 16m high)
- Resistant to design wind load
- Breakaway upon impact
Run off the road impacts frequently encounter fixed objects (Sign posts & Luminaires).

Increase safety by moving fixed objects out of clear zone.

Objects that cannot be moved should be made “Breakaway”.

Breakaways perform best if they have Omni-Directional capability.
Transpo’s Color - Safe®
Transpo’s Safety Solutions

1. Area Markings for Improved Safety
2. ADA Mats for Increased Awareness
3. High Friction Surfaces for Optimal Skid Resistance
Why Color-Safe®?

**DURABILITY**
- Plural component - cures through polymerization
- Long life under high traffic loads
- Snow plow resistant
- Excellent adhesion to asphalt and concrete
- Highly dimensional stability

**ECONOMY**
- Cold-applied (no heating required)
- Cost/performance
- Ease of maintenance (can be refreshed / no grinding off of old material)
- Extends the striping season - Cold temperature application

**SAFETY**
- Wet night visibility
- Excellent skid resistance and aggregate retention
- Refresh – Decrease traffic control issues
- Cures through polymerization (no VOCs)

**VISIBILITY**
- Maintains vibrant color - UV resistant
- Provides positive separation
- Wet-night visibility
- Excellent bead retention

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Transpo’s Safety Systems

Area Markings

High Friction Surfaces

ADA Mats

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Color-Safe® Area Marking

- Ready in less than 1 hour
  - Rapid installation, minimal traffic disruption
  - Applied cold, no external heat required

- UV resistant
  - Excellent Color stability, crack free

- Superb thermal stability
  - No softening in hot climates

- No solvent emission
  - 100% solid

- Great flexibility

- Excellent Durability
  - Cost efficient
  - Recoatable

- Excellent chemical resistance
  - Salt, oil, gasoline, grease = longer service life

- Great skid resistance – adjustable!
  - Designed to reduce or prevent skidding

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Easy Application

- Easy Application in a Wide Range of Temperatures (32°F and rising)
- No Special equipment Needed
- No External Heat Required
- Can be applied on Asphalt or Concrete Surfaces
- New asphalt: allow 30 days after placement, no surface prep required
- Surface temperature between 32°F-110°F (0°C-43°C).
- 4°F above the Dew Point temperature and the
- Relative Humidity should be 75% RH maximum.
- Concrete: remove surface laitance
- Dry, Clean Surface

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Mixed Resin And Aggregate Method
Application Procedure

Spray Broadcast Aggregate Method

NYC Bus Lane Application Photo

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Several pedestrians a year were injured at this Denver Crosswalk. **High visibility color** was used to decrease that number by 50%.

**Installation**

- Red area markings were used to define crosswalks at three busy intersections in downtown Denver, Colorado.
- The largest of the intersections was 16 lanes of traffic.
- The material covered a 4,750 ft area
- Reflective beads were added to the surface of the white accent stripe.
Cities have tested exclusive bus/bicycle/pedestrian lanes and are actively looking for a permanent, high quality material:

**Increased visibility means:**

**Increased Safety**
- Color Minimizes intrusion into special lanes

**Increased Economic Incentive**
- Color reduces unauthorized use of bus lanes, leading to reduced travel times and increased ridership.

MMA has enhanced UV stability and excellent durability when compared to other area marking systems.

Color-Safe® is the solution!

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Sustainability with Color

New York City, NY
Bus Lane Demo

City block was marked with Color-Safe in October 2010.

Syracuse, NY
Connective Corridor
Bike Lane Project

• 28,000 square feet of Green Bike Lane completed.
• Community and project managers are pleased with the application and community reaction.

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Sustainability with Color
Community Building with Green Bike Paths

Columbia, MO – Stewart Ave.
April 10, 2012

Los Angeles, CA – Spring St.
July 15, 2012

City of Eugene, OR
July 2012

St. Louis, MO
September 2012

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Airfield Markings
High Visibility and Fast Cure
Other Applications

Pedestrian Safety at Railroad Crossings

Pedestrian Plazas – Driveways – Universities – Hospitals

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AETEC – Madrid, ES

Turntable Test to EN 13197

- Wear Simulation
- Visual Consistency
- Color Stability
AETEC Turntable Test
Skid Resistance/Erosion

Evaluation Criteria:
• Skid resistance (EN1436): >45 SRT
• Erosion (Material presence): %

Outstanding performance after 8 years with 40,000 ADT!
**AETEC Turntable Test Visual Consistency**

**Visual consistency:**
Pictures taken at the beginning (prior to test run)

**After 8,000,000 wheel passages**
Corresponds to the “double” of the traffic load of “Approval Class P7”!

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Even after 8 Million wheel passages the color stability is consistent.
Samples were tested for a full 2,000 hrs regarding ASTM G154-06 and stayed below the $\Delta E^{*ab}$ limit of 7 throughout the test.

The samples were exposed to fluorescent tube (QUV) weathering, for a period of 2000 hrs. with interim checks performed at 500hr intervals. The test parameters are detailed below:

<table>
<thead>
<tr>
<th>Step</th>
<th>Function</th>
<th>Irradiance @ 340nm</th>
<th>Temperature</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>UV</td>
<td>0.89 W/m²</td>
<td>65°C</td>
<td>8:00 hrs</td>
</tr>
<tr>
<td>2</td>
<td>Condensation</td>
<td>.</td>
<td>59°C</td>
<td>4:00 hrs</td>
</tr>
</tbody>
</table>

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THANK YOU

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