

International Safer Roads Conference 2014
Cheltenham, England



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
-

Saving Lives...



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 & Luminares

- 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
-

Ground Mounted Sign Supports



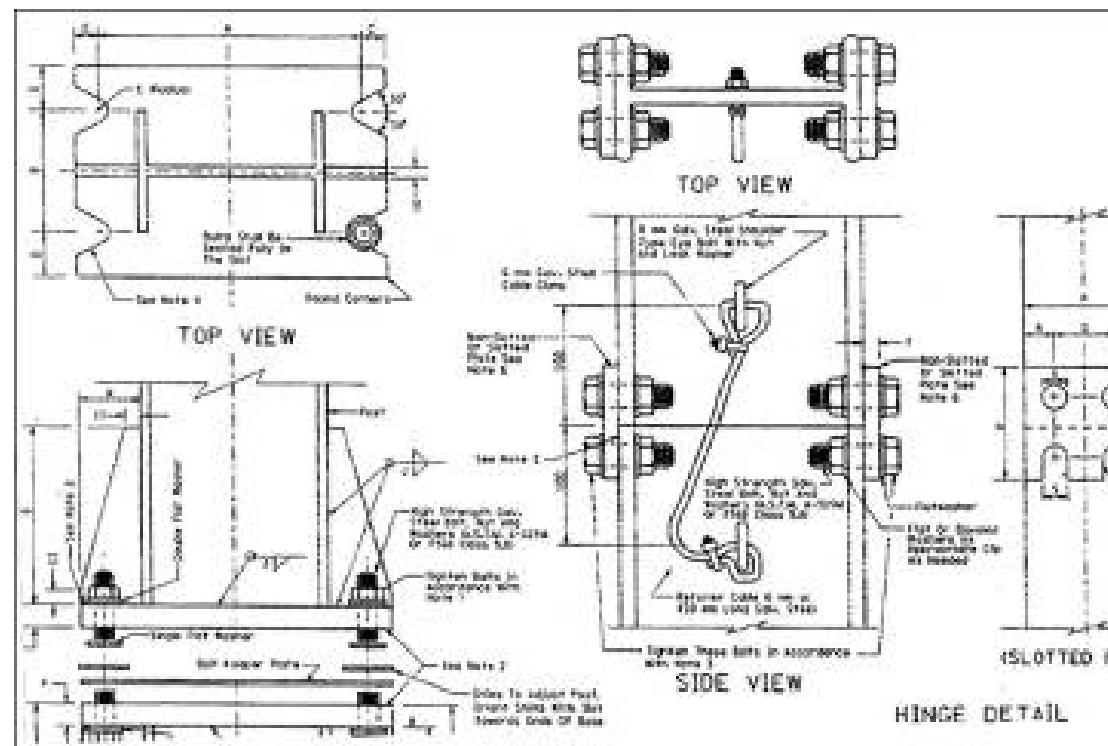
The history of breakaways for signs and light posts goes back 50 years in the United States.

- Slip Base
 - Omni-Directional Breakaway
 - Frangible Base
 - Frangible Coupling
-

Slip Base System



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).



Frangible Base System



- 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 System



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)



Pendulum Test



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



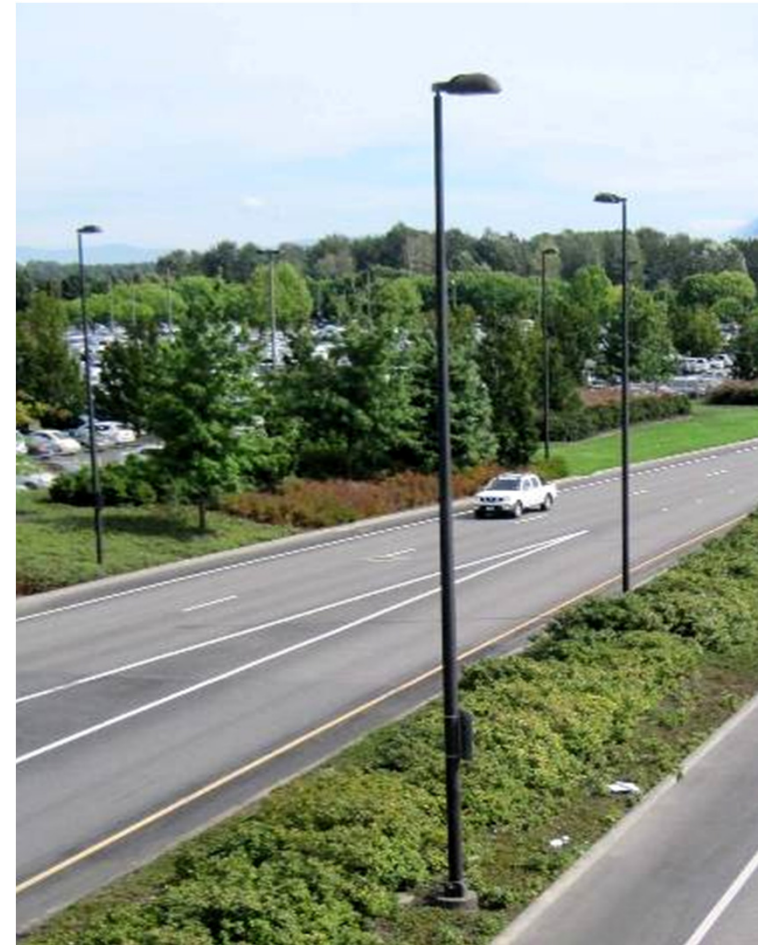
- Ground-Mounted Signs Located within Roadside Clear Zones
- Locations Vulnerable to Vehicular Impacts

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


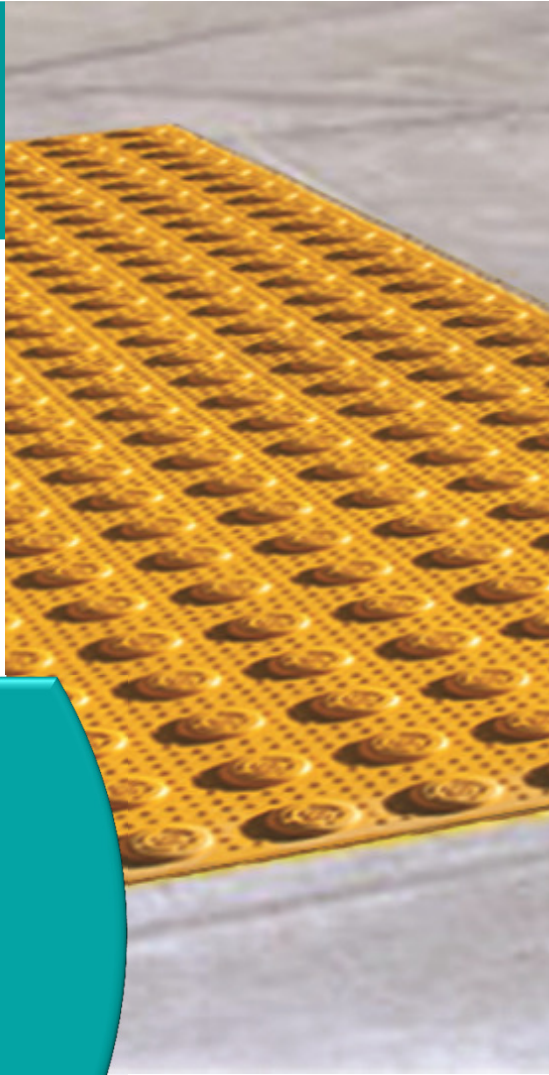
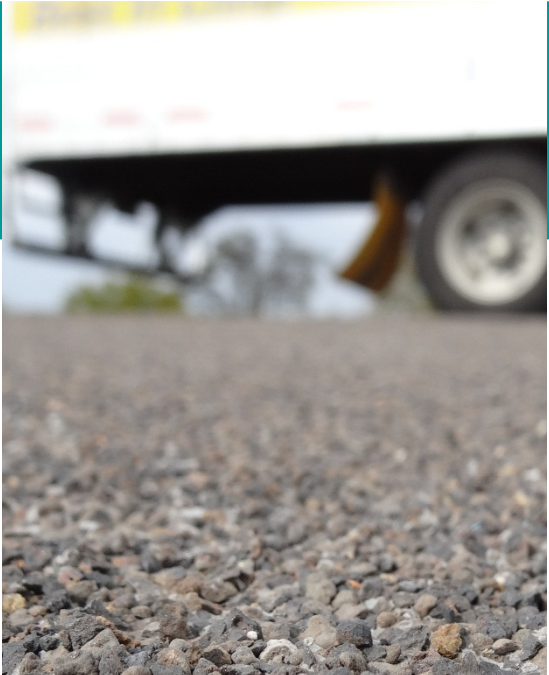



- Designed to support largest pole
- allowed (450 kg and 16m high)
- Resistant to design wind load
- Breakaway upon impact

Conclusion



- 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.
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Transpo's Color - Safe®

 **TRANSPO**®
INDUSTRIES, Inc.

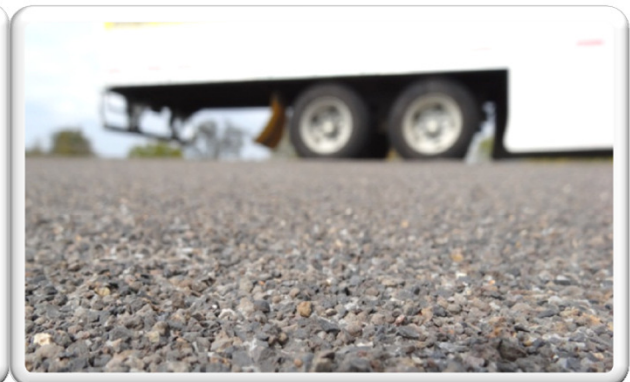
Transpo's Safety Solutions



1 Area Markings for Improved Safety

2 ADA Mats for Increased Awareness

3 High Friction Surfaces for Optimal Skid Resistance

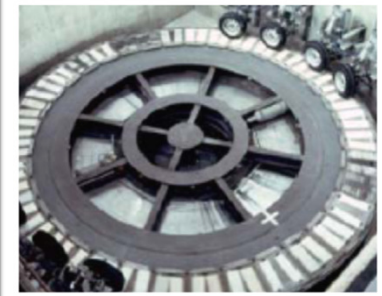


Why Color-Safe® ?



DURABILITY

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



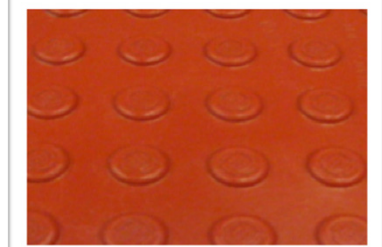
ECONOMY

- 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



Transpo's Safety Systems



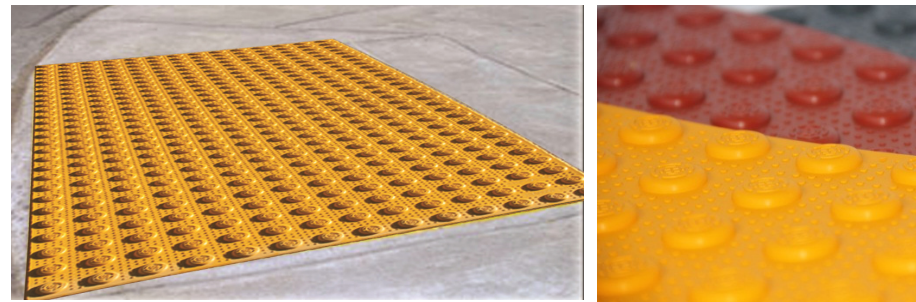
Area Markings



High Friction Surfaces



ADA Mats



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

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



Application Procedure



Mixed Resin And Aggregate Method



Application Procedure



Spray Broadcast Aggregate Method



NYC Bus Lane Application Photo

Crosswalk Safety: Denver, CO - Crosswalks



**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.



Sustainability with Color



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!

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.

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



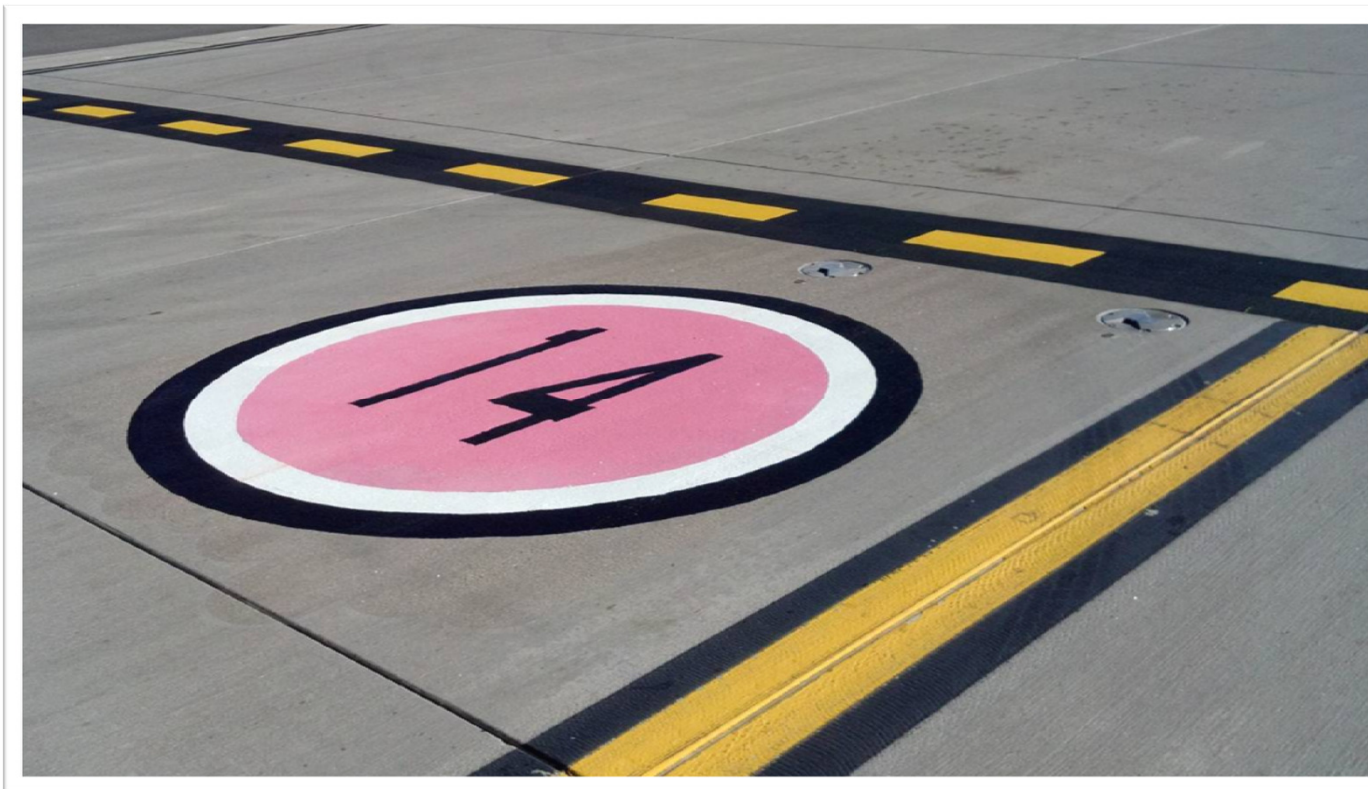
St. Louis, MO
September 2012



Other Applications



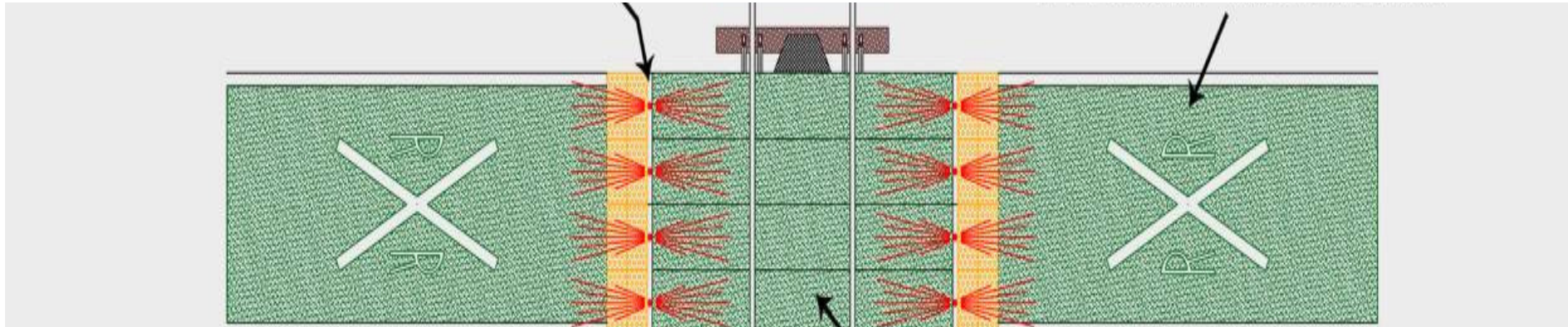
Airfield Markings High Visibility and Fast Cure



Other Applications



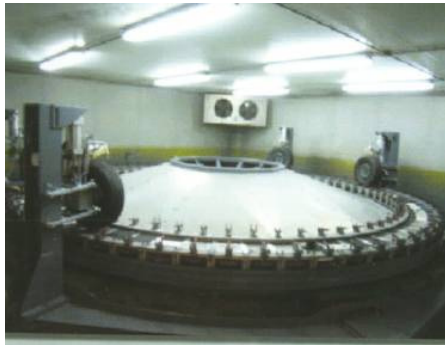
Pedestrian Safety at Railroad Crossings



Pedestrian Plazas – Driveways – Universities – Hospitals



Color-Safe® Performance Evaluations



AETEC – Madrid, ES

Turntable Test to EN 13197

- ☐ Wear Simulation
- ☐ Visual Consistency
- ☐ Color Stability

AETEC Turntable Test Skid Resistance/Erosion



Traffic Classes DIN EN 13197	Numbers of wheel roll-overs (Mio.) on RPA*
P0	not defined
P1	0,05
P2	0,1
P3	0,2
P4	0,5
P5	1,0
P6	2,0
P7	4,0

*RPA = Rundlaufprüfanlage (Turn table tester)

Evaluation Criteria:

- Skid resistance (EN1436): >45 SRT
- Erosion (Material presence): %

*Outstanding performance after 8
years with 40,000 ADT!*

3.- TEST RESULTS: initial and retained values

in accordance with EN 1436: 2009+A1

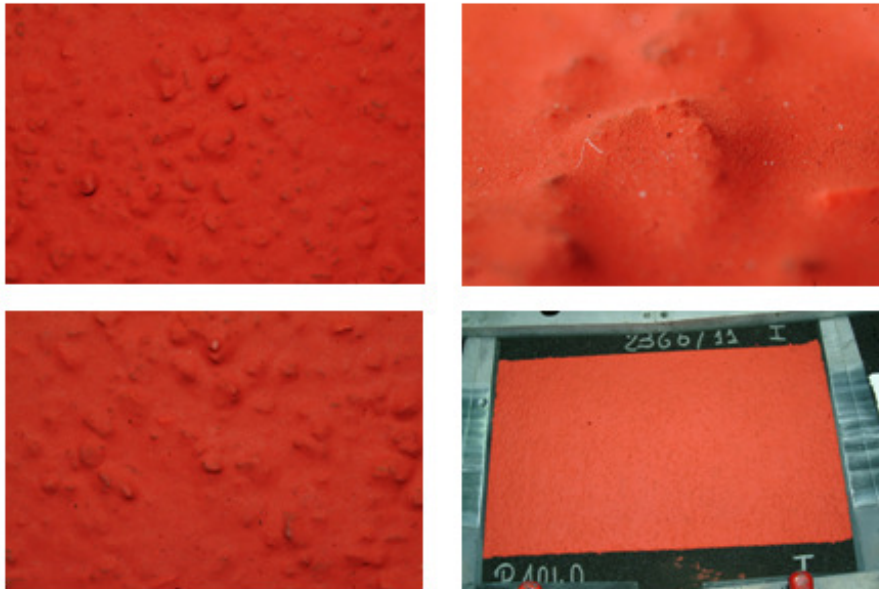
CHARACTERISTIC		Value for each number of wheel passages x 10 ⁶														Uncertainty
		0,01	0,1	0,2	0,5	1,0	2,0	3,0	4,0	5,0	6,0	7,0	8,0			
Night-time visibility $R_L, \text{mcd} \cdot \text{m}^{-2} \cdot \text{lx}^{-1}$	dry R_L	NPD	NPD	NPD	NPD	NPD	NPD	NPD	NPD	NPD	NPD	NPD	NPD			± 5 %
	rain RR	NPD	NPD	NPD	NPD	NPD	NPD	NPD	NPD	NPD	NPD	NPD	NPD			± 5 %
	wet RW	NPD	NPD	NPD	NPD	NPD	NPD	NPD	NPD	NPD	NPD	NPD	NPD			± 5 %
Day-time visibility	x	0,518	0,512	0,510	0,507	0,504	0,501	0,499	0,493	0,506	0,499	0,496	0,495			± 0,001
	y	0,334	0,333	0,334	0,333	0,334	0,333	0,333	0,334	0,334	0,334	0,335	0,334			± 0,003
	β	0,109	0,112	0,112	0,079	0,114	0,113	0,116	0,114	0,111	0,116	0,117	0,116			± 0,2
	Qd	69	63	78	67	87	77	76	76	71	102	78	105			± 9 %
Skid resistance	SRT	74	64	60	59	57	53	54	50	52	50	49	50			± 5
Erosion - % retained	%	100	100	100	100	100	100	100	100	100	100	100	100			

AETEC Turntable Test Visual Consistency



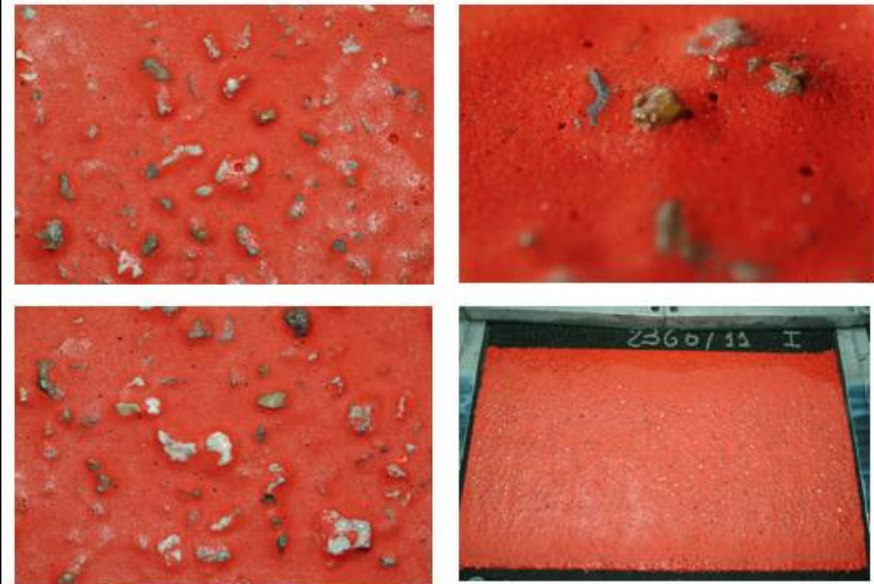
Visual consistency:

Pictures taken at the beginning
(prior to test run)



After 8,000,000 wheel passages

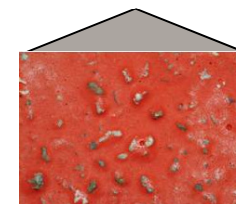
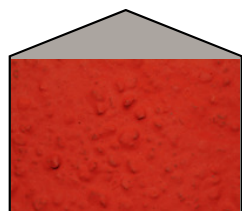
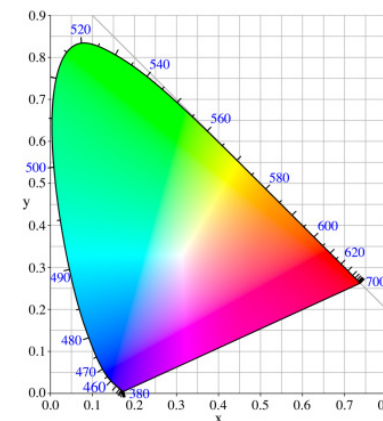
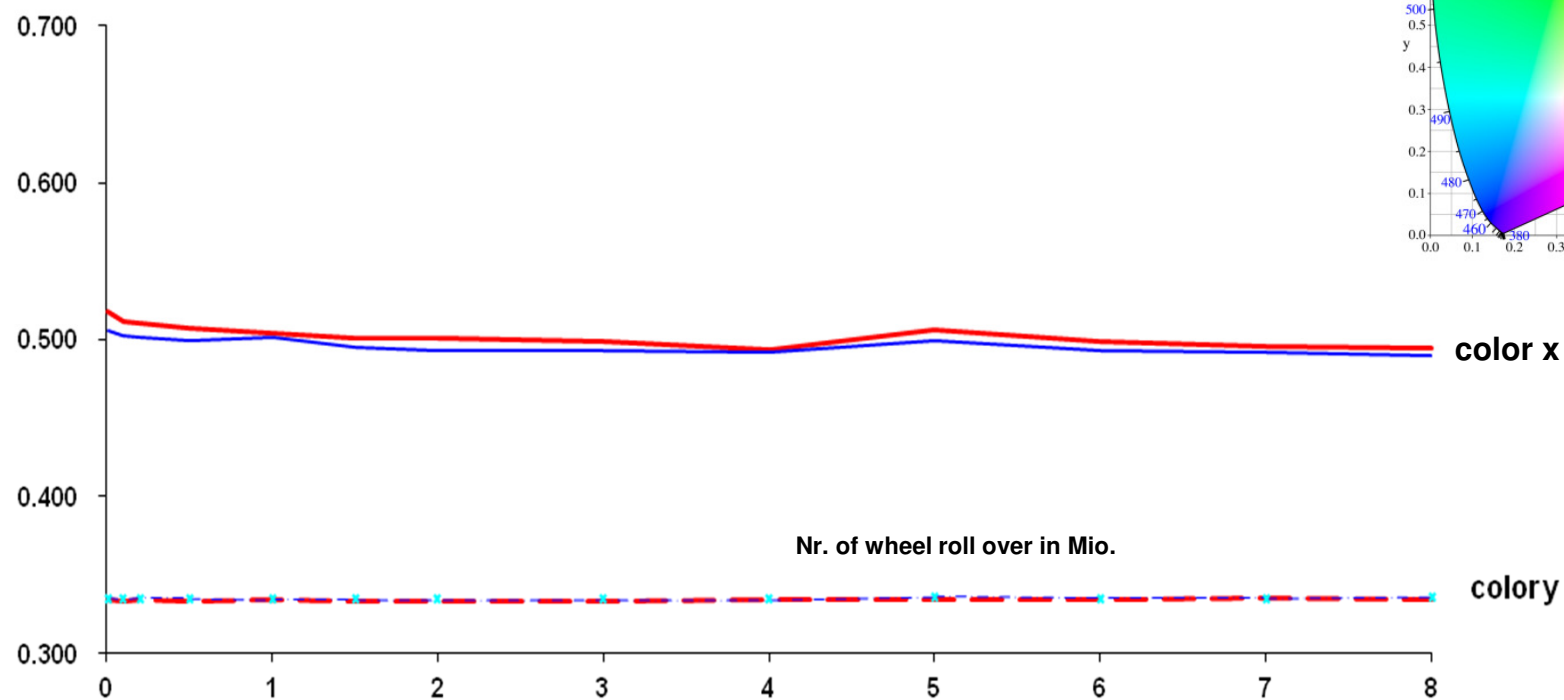
Corresponds to the “double” of the traffic
load of “Approval Class P7”!



AETEC Turntable Test Color Stability



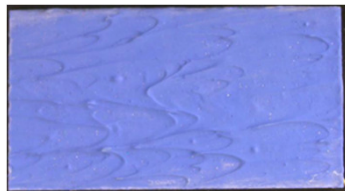
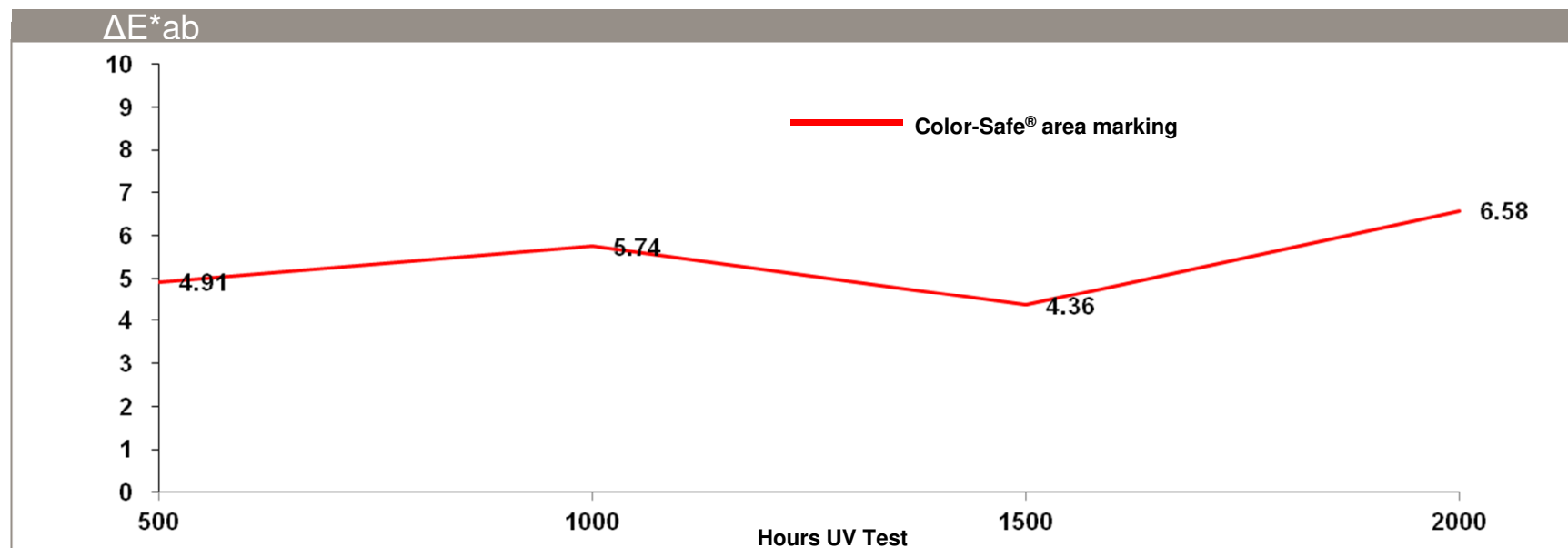
Even after 8 Million wheel passages the color stability is consistent



UV Weathering Test



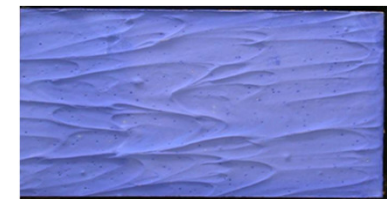
Samples were tested for a full 2,000 hrs regarding ASTM G154-06 and stayed below the ΔE^*ab limit of 7 throughout the test.



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:

Test Parameters (ASTM G154-06)

Step	Function	Irradiance @ 340nm	Temperature	Duration
1	UV	0.89W/m ²	60°C	8:00 hrs
2	Condensation	-	50°C	4:00 hrs



THANK YOU



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