

# Innovation



# Materials Matter

Presented By Gregor Senger  
FDOT District 4 Office of Modal Development  
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# Paint Overlay - Not Durable (6 month to 8 months)



- Installation Cost : \$2 per square feet
- Maintenance Cost: Very High
- Long Term Public Perception: LOW
- Paint is the most widely used method to mark road surfaces. Paint is considered a non-durable pavement marking, is easily worn by vehicle tires and the elements in snowy winter climates, and often requires annual reapplication. Paint is the least expensive of the overlay materials.
- Paint fades and chips soon after installation
- Poor skid resistance

# Epoxy Overlay – Midterm Durability (3 to 5 Years)

- Installation Cost : \$6 to \$11 per square feet
- Maintenance Cost: High
- Long Term Public Perception: Average

Epoxy is an adhesive, that is typically applied as a paint or spray.

The epoxy adhesive is applied to the surface and a color agent such as sand, Iron oxide (expensive) or grinded colored glass is cemented into the Epoxy.

Epoxy coating is skid resistant and retro reflective and adhere to concrete or asphalt surfaces.

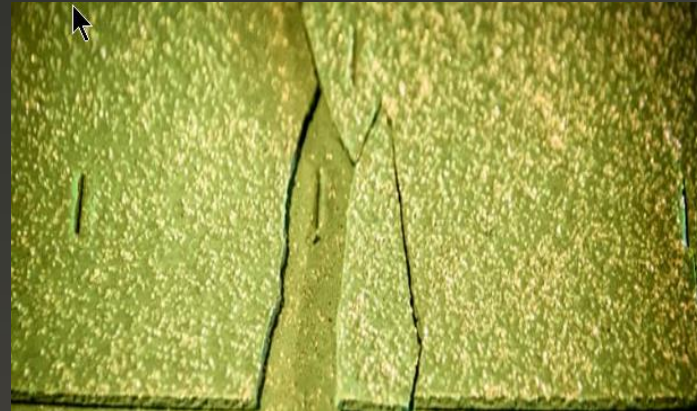
Epoxies is sensitive to moisture and temperature. Failure occurs when epoxy becomes bridled and is no longer able to secure colored aggregates.





# Thermoplastic Overlay – Midterm Durability (3 to 5 Years)

- Installation Cost : \$8 per square feet
- Maintenance Cost: High
- Long Term Public Perception: Average
- A type of plastic made from polymer resins that becomes a homogenized liquid when heated and hard when cooled.
- Thermoplastic can be pre-formed in specific shapes, such as tiles that can be assembled like a puzzle to color bicycle facilities.
- Thermoplastic tends to last about the same as epoxy/MMA and is easier to apply.
- Retro reflective and anti-skid materials can be applied or mixed throughout the plastic. Thermoplastic is more expensive than Epoxy and MMA and usably fails of density cracking.



# Colored Hot Mix Asphalt – Long Term Durability (5 to 8 Years)



- Installation Cost : \$5 per square feet
- Maintenance Cost: Low to None
- Long Term Public Perception: Very High

Colored hot asphalt pavement has the same strength, durability, skid and weather resistance as regular asphalt.



Worn out paint on a temporary painted bike lane in Delft



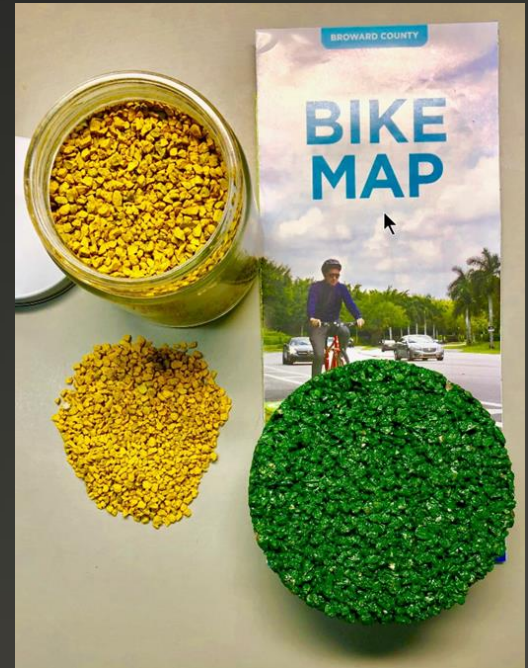
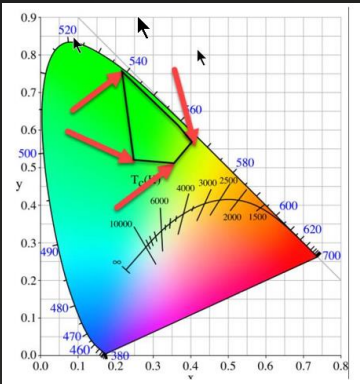
Bike street with red paving and (non-red) parking bay in Pijnacker

The photo on the left shows how the color has worn out on a painted bike lane compared to a colored asphalt bike lane on the right.



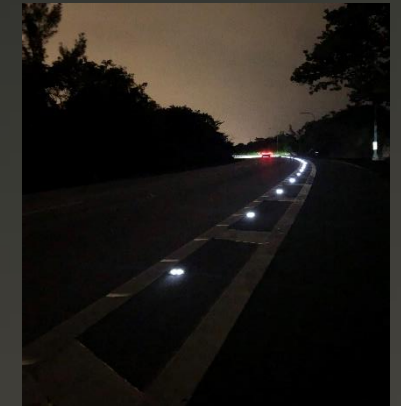
# Colored Hot Mix Asphalt – Long Term Durability (5 to 8 Years)

The color asphalt pavement is permanent and available in any color including FDOT approved green bike lane and rail road crossing dynamic envelop colors.



# Solar Powered Roadway Markers

- Physically separated using raised curbs, bollards, or concrete barriers is attracting more bicyclists in Europe, Asia, South America and limited U.S. Cities.
- FDOT design standards and policy do currently support a physical separation of bike lanes.
- A virtual separation using solar powered roadway markers as delineators may be a cost-effective alternative.
- The virtual separation consists of low cost embedded solar powered LED Delineators.
- Delineators are spaced 6 to 8 feet apart, creating a highly visible delineated bike lane.
- The objective of bike lane delineators are to add roadway awareness and virtual separation in order to attract more bicyclist.



Miami Dade County green, buffered and LED delineated bike lane



# Solar Powered Roadway Markers

Most vendors use inexpensive plastic, polycarbonate or acrylic lenses. These lenses have the tendency to oxidize, discolor and crack the clear protective lens resulting in complete failure.

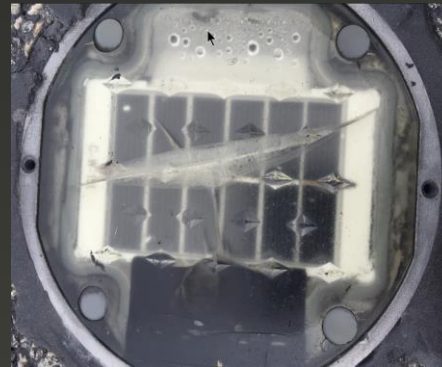
Failure is typically caused by oxidation to a point where the sunlight is no longer able to reach the photovoltaics and in effect can no longer convert sunlight into electricity to charge the battery. The result is total failure of the device.

Another mode of failure is cracking of the plastic lens, causing water intrusion into the electronic components of the marker.

Use of non-oxidizing and crack resisting materials is recommended,



Application: SR 811 (Wilton Drive)



Application: US 27



# GLOW IN THE DARK ROADS





60 miles southwest of Amsterdam, along 15,000 feet of Highway N329, cars follow stripes of glowing green paint that illuminate the edges of the road.



Dutch artist Daan Roosegaarde has created a beautiful and innovative glowing bike path that, when illuminated at night by glowing pebbles and LEDs, looks like Van Gogh's famous *Starry Night* painting.



# Glow in the Dark Roadway Material not ready for prime time



Photoluminescence is a material that does not immediately re-emit the radiation it absorbs. The material transitions absorbed radiation to lower intensity (afterglow) for up to several hours.

Initial discharge is very bright for a very short duration.

After glow can last several hours, but is not suitable for roadways in any meaningful application (at this time).

Texas A&M University materials lab is working on reformulating its campus glow in the dark bike lane material after limited success in its original application.





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