

HIGH PERFORMANCE ROAD MARKINGS

VISIBILITY GUIDE

How optics, glass beads, and materials work together to deliver brighter, safer roads



Visibility Is the Foundation of Road Safety

Visibility is the single most critical performance factor in roadway markings. Regardless of material type or application method, if a marking cannot be clearly seen—day, night, or in challenging weather conditions—it cannot effectively guide drivers or support roadway safety.

At SWARCO Road Marking Systems, high-performance visibility is not achieved through a single component. It is engineered through the integration of optics, glass beads, and marking materials, designed to function together as a complete system.

This guide explains how that system works, and why it matters.

UNDERSTANDING RETROREFLECTIVITY

What is Retroreflectivity?

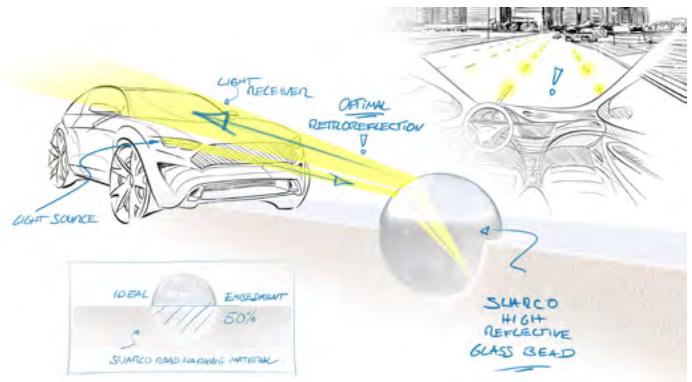
Retroreflectivity is the ability of a pavement marking to return light from vehicle headlights back to the driver's eyes. This performance characteristic is what makes pavement markings visible at night.

Unlike simple reflection, retroreflection sends light back toward its source, providing clear lane guidance even in low-light environments.

Why Retroreflectivity Matters?

- Enhances nighttime driver awareness
- Improves lane tracking at higher speeds
- Reduces reaction time in complex driving environments
- Supports safer navigation on unlit roadways

High-performance road markings must deliver consistent retroreflectivity, not just immediately after application, but throughout their service life.

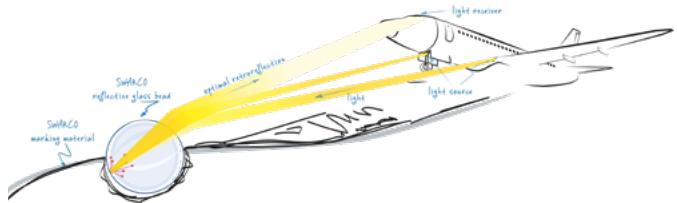


THE ROLE OF OPTICS IN VISIBILITY

How Light Interacts with Road Markings

When headlights illuminate a pavement marking, light must:

1. Enter the glass bead
2. Refract through the bead
3. Reflect off the marking material
4. Return efficiently to the driver



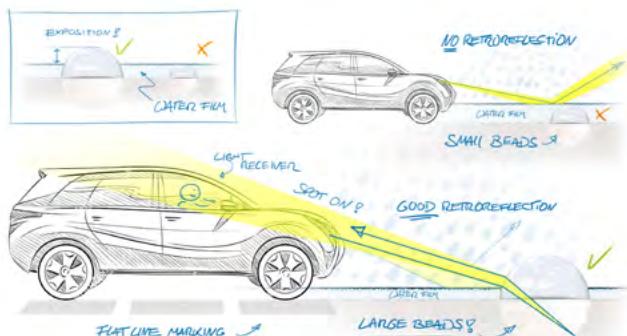
Each step is influenced by bead quality, bead placement, and the underlying marking material.

Engineered Optical Performance

SWARCO designs road marking systems to optimize:

- Light capture
- Internal refraction
- Efficient light return

This optical efficiency is critical for maintaining brightness at night and during wet conditions.



GLASS BEADS - THE HEART OF NIGHTTIME VISIBILITY

Why Glass Beads Matter?

Glass beads are the primary optical component responsible for retroreflectivity. Their size, gradation, clarity, and embedment depth directly impact performance.

Tailor-Made Glass Bead Solutions

SWARCO Road Marking Systems engineers glass beads as part of an integrated system, including:

SWARCO DURALUX

- Engineered for consistent optical performance
- Optimized for long-term brightness
- Designed to work seamlessly with high-performance materials
- High-durability bead technology
- Superior resistance to wear and bead loss
- Designed to retain retroreflectivity over extended service life



WET-NIGHT VISIBILITY EXPLAINED

Why Wet Conditions Reduce Visibility

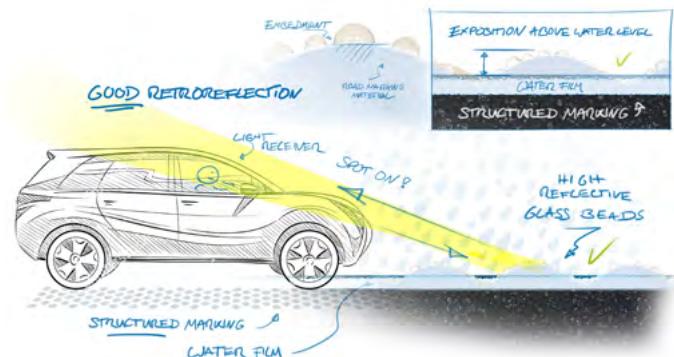
When pavement is wet, water can form a film over the marking, preventing light from reaching the glass beads effectively. Standard markings often lose retroreflectivity under these conditions.

Engineered for Wet-Night Performance

SWARCO high-performance systems address this challenge through:

- Specialized bead gradations
- Optimized bead protrusion
- Materials engineered to support effective bead exposure

The result is improved visibility during rain events, when drivers need guidance most.



THE ROLE OF MARKING MATERIALS

Materials as the Optical Foundation

The marking material beneath the beads plays a crucial role in visibility by:

- Providing contrast against the pavement
- Supporting proper bead embedment
- Reflecting light back through the bead

SWARCO Road Marking Systems materials are engineered to work in harmony with glass beads, ensuring consistent optical performance throughout the marking's life cycle.



System-Based Design

Rather than treating materials and beads as separate components, SWARCO designs them as a unified system—maximizing performance and reliability. Combining MMA, SuperStripe thermoplastic, or high-build paints with SWARCO DURALUX beads, for example, yield impressive results that stand up to wear and weather.

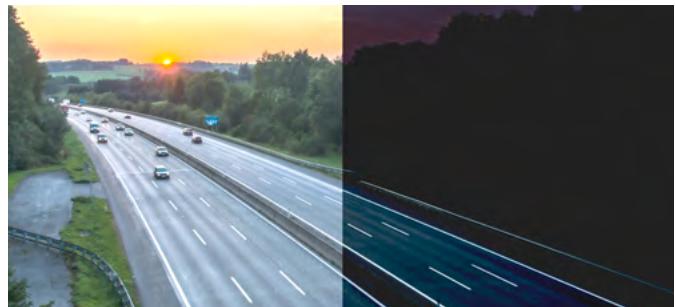
CONSISTENT DAY & NIGHT APPEARANCE

High-performance visibility is not limited to nighttime conditions.

SWARCO Road Marking Systems are engineered to provide:

- High daytime contrast
- Clear lane delineation
- Consistent appearance from day to night

This consistency helps drivers maintain confidence and predictability, regardless of lighting conditions.



VISIBILITY THAT LASTS

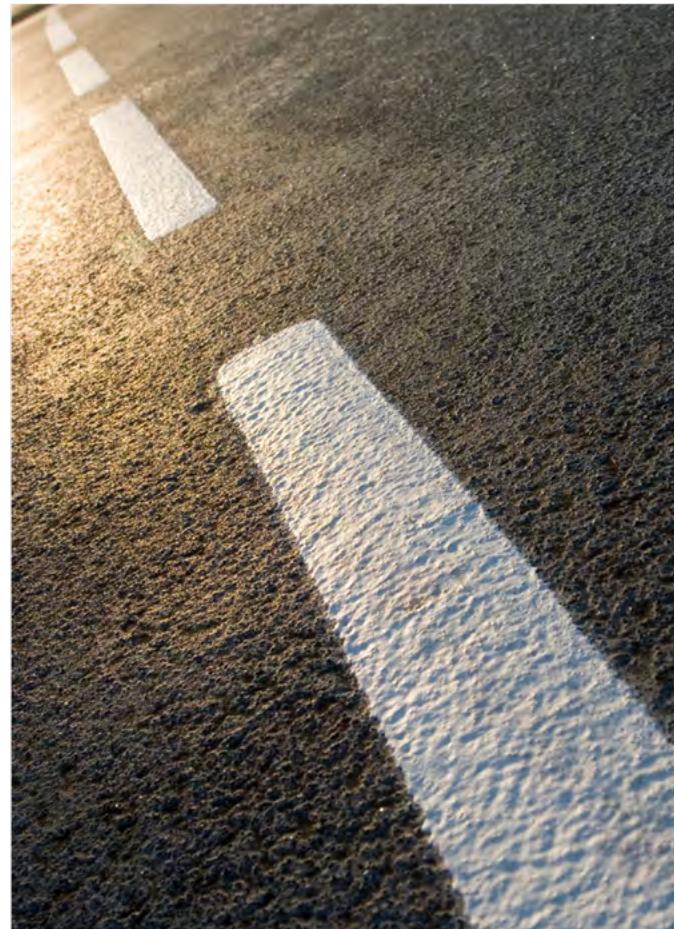
Visibility that fades quickly is not high performance.

SWARCO systems are designed to:

- Retain beads longer
- Maintain brightness over time
- Reduce the need for frequent restriping

Long-term visibility supports safer roads while reducing maintenance demands and life-cycle costs.

Each step is influenced by bead quality, bead placement, and the underlying marking material.



VISIBILITY BY DESIGN

High-performance visibility is not accidental—it is engineered.

Through advanced optics, tailor-made glass beads, and system-matched materials, SWARCO Road Marking Systems delivers visibility drivers can rely on—day, night, and in challenging conditions.

Visibility is the foundation of safety. SWARCO builds it into every marking.

LEARN MORE

Explore SWARCO's complete portfolio of high-performance road marking systems: www.swarco.com/rms