Non-Regulated RetroReflective Marking
Mold In Graphic Systems®

Guideline for *Non-Regulated* Polymer Fusion RetroReflective Marking on Rotationally Molded Polyolefin Thermoplastics

1. Introduction

1.1 Purpose

This document establishes a Guideline for Non-Regulated Polymer Fusion RetroReflective Marking, a durable, permanently fused RetroReflective solution for polyolefin thermoplastics. Designed for long-term visibility and identification, this technology is ideal for applications where traditional adhesive-backed reflective materials or other bonding methods fail due to adhesion limitations and environmental degradation on polyolefin thermoplastic products.

Definition of Non-Regulated

Polyfuze retroreflective labels are designed for Non-Regulated applications where added visibility and product identification are desirable but not governed by strict safety or performance standards, such as those for roadway signs, emergency gear, or other federally regulated safety devices. These labels provide durable, maintenance-free visibility through Polymer Fusion technology, making them ideal for a broad range of commercial, industrial, marine, and general products where compliance with specific government mandates (like ASTM D4956 for traffic signage or ANSI/ISEA 107 for high-visibility clothing) is not required.

1.2 Scope

This guideline outlines the durability, reflectivity, and performance benchmarks for Polymer Fusion Non-Regulated RetroReflective Marking on rotationally molded polyolefin-based products used in industrial, commercial, and safety-related applications. The RetroReflective layer can cover the entire label, be integrated as a design feature, or serve as a standalone marking, providing flexibility to meet the specific needs of the application and the customer's vision.

2. Performance Requirements

General Guidance on RetroReflective Performance

Polymer Fusion Labels are engineered to permanently fuse into polyolefin thermoplastics and remain intact for the life of the product. While the label's structural durability is proven under extreme conditions, RetroReflective performance can vary based on environmental and application-specific factors, including:

- Base resin and application conditions (surface texture, color, and composition of the plastic part)

Label under normal indoor ambient lighting with no direct illumination.

Flashlight introduced near the viewing angle, beginning to activate RetroReflective response.

Fully illuminated with in-line lighting aligned to the viewer's perspective, demonstrating RetroReflective performance.

Photos are unaltered and were taken in a standard office setting. Label courtesy of Advanced Pedestals (API)

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- Environmental conditions and regional climate (e.g., prolonged sun exposure in desert regions vs. lower UV intensity in shaded or colder environments)

- Exposure to UV radiation, moisture, temperature fluctuations, and abrasives

Because these variables are outside our control, retroreflectivity may naturally diminish over time. While the label itself will remain physically fused and legible, users should assess reflective needs and performance in the context of their specific operating environment and application requirements.

2.1 Retroreflectivity Performance (Third-Party Testing – Vartest Laboratories, see page 5)

Polymer Fusion RetroReflective Marking has undergone third-party evaluation for retroreflectivity performance. The following measurements were obtained:

- Entrance Angle 0.2° / Observation Angle 5°: 4.9 cd/lx·m^2

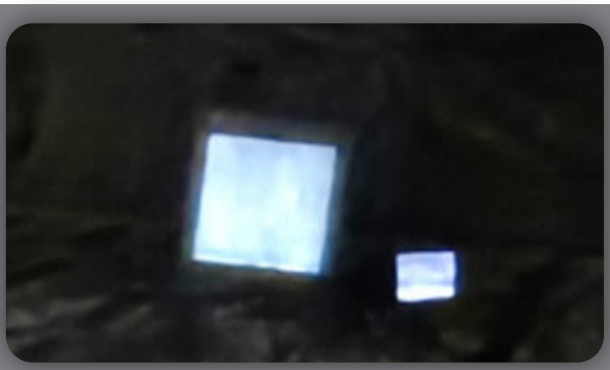
- Entrance Angle 0.2° / Observation Angle 5°: 4.8 cd/lx·m^2

What These Numbers and Vartest Report Mean:

These values confirm that the label does retroreflect light when illuminated, such as by flashlights, headlights, or any type of viewer line-of-sight lighting, making it suitable for enhanced visibility in low-light conditions.

While not intended to meet specific reflectivity thresholds for regulated safety signage, this level of reflectivity can be valuable for general identification, branding, or added visibility where durability and environmental resistance are critical.

Left: White field sample | Right: Warning graphic sample Positioned during daylight hours at the far end of the MIGS property for long-range visibility testing.



Nighttime view taken approximately 1000 feet away while approaching from the entrance, with vehicle headlights activating the RetroReflective label.

Photos unaltered. Label courtesy of Advanced Pedestals (API)

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2.2 Durability Testing (Accelerated Weathering – ASTM D4587)

To evaluate long-term performance under environmental exposure, Polymer Fusion RetroReflective Marking has been subjected to accelerated weathering conditions using ASTM D4587 (Fluorescent UV-A, 340nm).

Test Parameters:

- UV Exposure: 8 hours at 70°C (158°F)
- Irradiance: 1.15 W/m^2/nm at 340nm
- Condensation Cycle: 4 hours at 50°C (122°F)
- Relative Humidity: Controlled at ≥95% during condensation phase
- Cycle: Continuous repetition of UV exposure and condensation
- Test Chamber: Fluorescent UV-A exposure chamber per ASTM D4587 specifications

Current Status & Performance Benchmarks

- Surpassed 1000+ hours of QUV accelerated weathering with +/- 1% reflective variance to baseline and no visible sign of degradation in structural durability or fusion. This duration represents the equivalent of approximately 2.5 to 5 years of outdoor environmental exposure, depending on specific application and location.
- Ongoing monitoring of retroreflectivity retention is underway. As with all reflective materials, some gradual reduction is expected over time due to UV and environmental exposure. However, the polymer fusion label remains physically fused and fully legible.
- Final failure point and extended performance benchmarks will be determined through continued QUV testing and long-term exposure analysis, supporting a complete understanding of lifecycle performance.

3. Key Advantages of Polymer Fusion RetroReflective Marking

Unlike traditional adhesive-backed RetroReflective labels and sheeting, Polymer Fusion RetroReflective Marking is:

- Permanently fused into the polyolefin substrate, eliminating adhesion failure.
- Highly resistant to UV degradation, impact, moisture, and chemical exposure.
- Designed for long-term outdoor and industrial durability.
- Suited for applications where standard adhesive-backed reflective materials are ineffective.

4. Market Segments & Recommended Use Cases

Polymer Fusion RetroReflective Marking is designed for general use across multiple industries, providing enhanced visibility and identification where traditional labels fail. On the next page are key market segments that could benefit from General Use RetroReflective Polymer Fusion Technology:

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Category	Example Applications
Industrial & Commercial	Material handling bins, returnable transit packaging, logistics crates, utility enclosures
Emergency & Rescue Equipment	Spine boards, emergency flotation devices, fire/rescue equipment
Traffic Equipment	Road barriers, construction barricades, bollard covers, impact protection devices
Marine & Boating Equipment	Kayaks, canoes, buoys, marine markers, dock equipment
Power Sports & Recreational	Personal watercraft, off-road vehicle accessories, recreational markers
Utility & Electrical	Pipeline markers, electrical equipment housings, industrial enclosures
Tanks & Storage Containers	Liquid storage tanks, chemical containment, environmental containers
Agriculture & Livestock Equipment	Livestock feeding and watering troughs, seed hoppers, fertilizer tanks
Industrial & Commercial Waste Management	Waste bins, hazardous material containers, recycling stations
Commercial & Recreational Seating	Stadium seating, park benches, playground equipment
General Branding & Identification	Industrial signage, equipment labels, molded product branding

5. Conclusion

This Non-Regulated General Use Guideline establishes Polymer Fusion RetroReflective Marking as a durable, long-term solution for polyolefin thermoplastics, validated through third-party reflectivity testing and ASTM D4587 durability evaluations.

This classification is intended to guide manufacturers, industries, and procurement teams in evaluating the benefits and potential applications of Polymer Fusion Non-Regulated RetroReflective Marking for enhanced visibility and durability in demanding environments.

For more information, visit www.moldingraphics.com or contact our team for custom labeling solutions.

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Vartest Laboratories

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ISO/IEC 17025 Third Party Test Report

DATE: March 7, 2025

FILE: MOLDIN.A022425A
PO #: 32143

CLIENT: Mold In Graphic Systems
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Clarkdale, AZ 86324

ATTN: Mackena Koss

SAMPLE IDENTIFIED BY CLIENT AS:

Other Submitted
Ref: WARNING GRAPHIC

TEST PROCEDURES:

TEST RESULTS:

Retroreflective Material Testing Report

PHYSICAL PERFORMANCE:

Take Measurements at $\varepsilon_1 = 0°$ and $\varepsilon_2 = 90°$.					
Test	**Section**	**ANSI/ISEA 107 Requirement**	**Test Result**		**Pass/Fail**
Retroreflection	9.2, 10.4.1	R_A (0.2°/5°) > 100 cd/(lx.m^2) at ε_1 R_A (0.2°/5°) > 75 cd/(lx.m^2) at ε_2	ε_1:	4.9	N/A
			ε_2:	4.8	

Signed For The Company By

Joseph Lin
Laboratory Manager

VARTEST LABORATORIES Tested & Exclusive

Ashik Faisal
Technical Director

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