



Transpo Industries, Inc. manufactures a variety of innovative products and materials designed for improving road safety and bridge preservation. The company's reputation as an expert in rehabilitation, preservation, and safety has made Transpo a leading supplier since 1968.

WWW.TRANSPO.COM

Color-Safe® PAVEMENT MARKING

Methyl Methacrylate (MMA) Resin System

Why Choose Color-Safe MMA Over Thermoplastic?

To understand the benefits of choosing Color-Safe® over thermoplastic, it's best to understand more about each material.

Thermoplastic

A thermoplastic polymer is made up of long, unlinked polymer molecules, generally with a high molecular weight. Because the molecular chains are unlinked, they rely on other interactions for desired outcomes.

As seen in its name, thermoplastic is a plastic, which means it is pliable. Heat (hence, thermo) is what helps shape and mold plastics into the solid end product they become. The end product can take on many forms—from pliable, soft plastics with adhesive qualities, to hard smooth-finished solid forms like tubes (PVC pipes) or containers.

Methyl Methacrylate—MMA

Methyl methacrylate is a monomer (such as vinyl acetate, acrylic and methacrylic esters, and acids) that is a key building block for acrylic-based polymers. Polymers are used in many everyday applications in the home or industrially. Either way, they impact our lives on very personal levels—providing assistance with installations that rely on its many characteristics.

MMA is utilized in situations when safety is the main focus, as when used for pavement marking, such as crosswalks, bus and bike lanes, airfields, and industrial applications; among the other safety-promoting properties MMA has, it impregnates concrete to make it water repellent. MMA can be transparent and is so durable, it is used as a glass substitute for shatterproof windows—skylights, illuminated signs, aircraft canopies, instrument panels. Its adhesive feature forms tough bonds that resist peel, shear, cleavage, and impact stress. MMA adhesives can bond with most substrates—metal, magnets, plastic, glass, wood, and composite materials—and are tolerant of poor surface conditions, such as oil or grease on a roadway. Because of the rapid cure time, MMA adhesives are widely used in many industries for structural bonding of advanced materials. They are used in aerospace, automotive, composite, and transport and safety markets.



SAFER TRANSPORTATION THROUGH INNOVATION

Many Applications of MMA

Given the details above, it's not surprising that methyl methacrylate monomer is used to create a vast array of materials. Its chemical feature that readily polymerizes to form high molecular weight homopolymers and copolymers is attributed to this.

Along with the applications stated above, MMA can be used in safety glazing, plumbing components, building panels and sidings, textile finishes, packaging floor polishes, construction material, and metal and foil coatings. It is so versatile, it is even used in the fields of medicine and dentistry to make prosthetic devices and as a ceramic filler or cement.

Chemical Attributes

MMA is an important factor in the use of materials for such applications because its chemical makeup contributes to durability, strength, transparency, and UV and abrasion resistance.

Flexibility of Use

The chemical components of MMA enable it to be used with a variety acrylic copolymers. This "flexibility" has allowed Transpo® Industries, Inc. to create a proprietary formulation that sets Color-Safe far apart from other products on the market that use MMA and from thermoplastic products.

Why Color-Safe Is Different: Our Chemistry

Color-Safe is a proprietary formula that uses methyl methacrylate (MMA) as its foundational element. While MMA is a better product than thermoplastic, many suppliers of MMA have jumped on the bandwagon with promises of high performance. However, they do not have the proprietary MMA formulation of Color-Safe, therefore, cannot claim the same superior performance benefits of Color-Safe. MMA comprises a portion of our proprietary formulation, which when combined with our advanced chemistry, creates the superior functionality of Color-Safe. For instance, Transpo's proprietary chemistries—which include MMA—provide better weather resistance and increased outdoor life for the product and application.

Color-Safe Specialty Applications

Color-Safe has two applications: primarily as pavement marking, and secondarily as overlay for platforms and sidewalks where color matching is a factor.

As the name suggests, Color-Safe employs the use of bright, highly visible colors—which can be custom-created to make unique, vibrant designs, specialty markings, or logos—to increase appeal while improving safety.

Color-Safe, the durable pavement marking material, fits into Transpo's portfolio of state-of-the-art safety products with its wide-spread use on any high-traffic areas where safety, visibility, durability, and longevity is vital, such as:

- Highways
- Roadways
- Runways
- Bus Lanes
- Crosswalks
- Pedestrian Safety Areas and Walkways
- Bike paths
- Parking installations for retail malls, public parking for cities and towns
- General industrial



Setting the Standard for Safer Roads

Markings must remain vibrant to be a safety feature. The contrasting colors of custom-designed crosswalks alert drivers and can significantly reduce the number of pedestrians injured due to vehicular accidents at crossings. But visibility is not their only function, especially when used on high-traffic areas and crosswalks.

Color-Safe MMA-based area markings are known for:

- High durability
- Increased wet-night visibility
- Skid resistance
- Optimal color stability

Organizations, agencies, and department heads rely on Color-Safe for ease of application, customization, high-durability, and safety:

- Municipalities
- Universities
- School systems
- Airports—conformity to FAA regulations
- Hospitals
- Public Works
- Department of Transportation officials
- General contractors
- City managers
- Safety engineers
- Logistic planners
- Bicycling organizations

Durability

Transpo's Color-Safe MMA marking material is not only one of the most durable markings in the industry, but it can be applied in cold weather, extending the marking season. Due to their high durability, color stability, and high-definition colors, MMA road markings cost less in maintenance and material costs over the extended lifecycle of the markings. Color-Safe is capable of full cure in a wide range of temperatures, down to 40°F, and adheres to both concrete and asphalt surfaces. MMA symbols and striping develop a strong bond to existing MMA; another reason that Color-Safe is a viable, superior alternative to thermoplastic markings.

This increased functionality makes Color-Safe MMA a preferred choice of transportation and safety officials as the optimal material for special-use lane marking material.



Color-Safe MMA



Applied Thermoplastic

Color-Safe MMA Features and Advantages

- Variety of standard and custom colors; aggregate types and sizes available
- Durable skid-resistant surface
- Excellent vibrant color retention
- Easily customizable designs for high-visibility safety and identification purposes
- Fast cure in a wide range of temperatures (40°-100° F); lengthens the marking season
- Low life-cycle cost (6 to 10 years; requires simple refresh vs. removal and re-application)
- Strong adhesion to concrete and asphalt surfaces; minimized cracking and bubbling
- Installations can be modified, depending on traffic usage, for superior skid resistance and drainage
- Safe, easy application vs. cumbersome process: mix-and-apply vs. hot, potentially uneven application and risk of burn
- Save time: set-up and installation time is cut in half with Color-Safe
- Color-Safe frees up work crews—time and money—so they can complete other projects as well
- Expert customer support from Transpo

Problems with Thermoplastic

Heat. As discussed, thermoplastic requires the application of heat, whether while applying in liquid form, or the use of a blow torch when using pre-forms. One concern regards the materials used: alkyd and hydrocarbons cannot be mixed in the melter. If there is a material change, the melter must be thoroughly cleaned prior to using the other material. Other considerations are the weather elements such as wind chill, which can result in raising the temperature of the thermoplastic to compensate, though may cause overheating that may char the material. Other problems that can result, for both the people applying the thermoplastic, or for the longevity and durability of the application are:

- **Risk of injury**—serious burning is common from either the hot liquid or from blowtorches.
- Working with hot plastic is very tricky and **must be applied at the proper temperature**—precision and timing is also required for proper thickness, and can be difficult to master. If the material is too hot or heated too long, it will scorch and affect bonding, durability, and color. If it is too cold, it will not melt or bond thoroughly and the reflective beads will not properly disperse, causing poor reflectivity.
- If a sprayer is used for application, it may result in **heat loss**, which may adversely affect the bond between the marking and the substrate; the thickness may also be compromised, as it is directly affected by the speed of the applicator.

Application. In addition to the logistic concerns above, there can be issues during the application process, once thermoplastic is applied, or there may be problems that begin immediately or become problematic over time.

- **Grooves and scratch marks** (can be deep and long) caused from scorched, hardened thermoplastic solids and foreign solid particles at the discharge point when applying. Requires inspection of the filter sieve and removal of foreign matters.
- **Pinholes** in the thermoplastic can result from various causes involving moisture. Testing for moisture prior to applying is recommended, though can add time to the job. Some problems that cause pinholes are:
 - Expanded air inside an open void of the road
 - Insolated moisture expanding and evaporating inside wet concrete; may require allowing the concrete to “age” prior to applying
 - Solvent evaporation from wet primer
 - Evaporation and expansion of moisture under the road surface
- **Bleeding** caused by soft bituminous binders of conventional asphalt melt combining with molten thermoplastic; or from excessive wet primer oozing out through the molten thermoplastic.
- **Cracks** caused from a variety of variables:
 - Cracks on the aggregate of the road surface
 - Thermoplastic is too hard and cannot cope with the softer asphalt road surface, which may require intervention from the thermoplastic supplier
 - Thermoplastic does not follow the shrinkage and expansion of the road; new asphalt is prone to more problems, creating cracks along the edges at regular intervals
 - Uneven thickness while applying causes different hardening speeds of the thermoplastic
- **Hollows and hairline cracks** on the top film caused by the uneven dispersion of the tiny beads. Cratering can also occur on these irregular road surfaces and is caused when the application speed is too fast.
- **Irregularities** on the line surface cause rough irregularities on the cross direction, which occur from the poor deposit of the thermoplastic from the applicator shoe; may also require raising its temperature.
 - Stripe marks can be seen horizontally due to the applicator machine moving up and down against a rough road surface
- **Poor retroreflectivity at night** can occur either overall or in a specific area. This can be caused by:
 - Uneven dispersion of the beads and insufficient drop-on beads
 - If old films are uneven, with bad adhesion of the beads in the overlapped area
 - If the thermoplastics is overheated or underheated
 - Material guns and bead guns not being synchronized to ensure proper reflectorizing; remedial measures include inspecting the dispersion mechanism and adjusting the dispersing rate
- **Peeling** can be caused by the following:
 - Old asphalt and concrete have not been treated with primer
 - Road surface is not properly cleaned; grease and oil remain
 - Too much moisture on the road
 - Low road surface and ambient temperature

SAFER TRANSPORTATION THROUGH INNOVATION

- Color changes (from white to dirty white, and yellow to dark green) is due to the thermoplastic being overheating while preheating. It can also be caused when old and new materials are mixed. Discoloration means that the material is brittle, with low durability. As well, when changing from one thermoplastic color to the other, to ensure the true color, it is necessary to run several bags of the new color through the system—and then discard it.

There are a number of problems that often occur with thermoplastic applications, limiting their useful lifecycle, that range from cracking and cratering to delamination and discoloring. These all compromise the safety of the material's original purpose, requiring extensive training and set-up and expensive re-application to remedy.

At a Glance: Comparing Color-Safe MMA to Thermoplastic

	Color-Safe MMA	Hot-Applied Thermoplastic
Adhesion to Concrete	Excellent	Poor
Life Cycle	6 – 10 Years	3 – 5 Years
Cost-Effective Material, Installation, and Maintenance	Yes	No
Refresh or Remove	Refresh	Full removal
UV Stable/Colors Remain Vibrant	Yes	No
Ability to Customize for Skid Resistance, Drainage, Color, and Design	Highly	Extremely limited
Cure Time	20 – 40 minutes	Wait for cooling
Adhesion to Existing MMA	Yes	No
Application	Easy, minimal effort to create custom colors/designs	Training needed; can be difficult to master
Working Hazards	None	Potential burns to humans and charring/compromising of product
Specialized Equipment Needed	No	Yes

This chart sums it up: Color-Safe is manufactured for superior quality, performance, and reliability and delivers that by providing a more cost-effective, durable, vibrant, customizable, and safer pavement marking solution for you and your crews.

Transpo is committed to safety—just like you. We are also passionate about Color-Safe and are happy to meet with you and provide a demo. We'll make sure that when its installation time, you have the support of one of our experts, so your installation will go smoothly.

Wondering just how much money you'll save in time and resource? [Contact us](#) now to find out how cost-effective Color-Safe MMA is.

Since 1968, Transpo® Industries, Inc. has been dedicated to supplying the finest products to the transportation industry. Transpo manufactures innovative products and materials designed for improved road safety and preservation that are widely recognized for their quality, performance, and reliability. Its reputation as an expert in roadway safety has made the Transpo a leading supplier of products to help ensure safer, more forgiving and sustainable transportation infrastructure. Transpo proudly maintains an ISO 9001:2008 certification at all company facilities. Transpo products are sold across North America and international markets.

Through three distinct divisions: Distributor, Safety Products, and Material and Precast Polymer Concrete, Transpo Industries, Inc. operates a cohesive business which includes the wholly owned subsidiary Castek®. The Safety Products manufacturing division and the Distributor group are based in New Rochelle, NY and Castek's manufacturing division is located in Berwick, PA.

Sources:

Methyl methacrylate (MMA): <https://www.gantrade.com/blog/5-key-facts-on-methyl-methacrylate-monomer-mma>

Thermoplastic: <https://cen.acs.org/articles/88/i36/Road-Markings.html>

<http://pslc.ws/macrog/plastic.htm>

<https://sciencing.com/thermoplastic-polymer-5552849.html>

Troubleshooting thermoplastic: <http://www.sivico.com.vn/en/traffic-paint-sep/traffic-paint-technology/88-guidelines-to-trouble-shooting-in-application-of-thermoplastic-pavement-marking-material.html>

Virginia DOT thermoplastic: http://www.virginiadot.org/business/resources/Materials/MCS_Study_Guides/bu-mat-PaveMarkCh4.pdf



Need More Information?

WWW.TRANSPO.COM/PAVEMENTMARKINGS

Contact the materials experts at Transpo to find out more about the various products we offer. If you need advice on how to install the product, the professionals at Transpo will guide you through the process. Project specific questions? We can assist you in creating a cost-effective, tailored solution for your project.

Transpo Industries, Inc.
20 Jones Street
New Rochelle, NY 10801

914.636.1000

800.321.7870

914.636.1282

info@transpo.com

Phone

Toll Free

Fax



Manufactured and Distributed By:

CASTEK
A TRANSPO INDUSTRIES COMPANY **INC.**