

Avery Dennison® V-9700RR Series Conspicuity Tape for Railcar Delineation

Issued: July 2013

Avery Dennison® V-9700RR Series Conspicuity Tape is designed for railcars and locomotives for easy nighttime detection and recognition. It is a high quality, durable, microprismatic retroreflective material with a pressure sensitive adhesive. The single layer construction does not require edge sealing.

Avery Dennison V-9700RR Series Conspicuity Tape increases the visibility of your rolling stock. Offered in both yellow and white and carries the required FRA-224 certification. Available in 4" wide rolls as well as strips and kiss cut finishes. V-9700RR comes with an aggressive adhesive for low temperature applications.



Performance:
FRA-224 Certified



Durability: 10 years
Vertical exposure only



Orientation: Omni-Directional



Face: Acrylic Retroreflective Film with Microprisms



Adhesive: Low Temperature Pressure Sensitive



Liner: Polymeric Film



Application Surface: Metal & Painted Metal

Features:

- Typical values are 2 times higher than required by specifications
- Single layer construction does not require edge sealing
- Provides exceptional all-distance viewing at dawn, dusk, and night
- Approval marks are protected against abrasion ensuring continual compliance
- Heavy duty adhesive allows users to apply at low temperatures

Finishes:

- 4" x 50 yard Rolls
- Kiss Cut Rolls
- Pre-Cut Length Strips
- Custom Finishes

Product Availability:



White



Yellow

Applications:

- Railcars
- Locomotives

Product Data Sheet
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Retroreflectivity:

V-9700RR **exceeds** all minimum coefficients of retroreflection requirements for FRA 224 (49 CFR 224) as shown in **Table A**.

Table A:

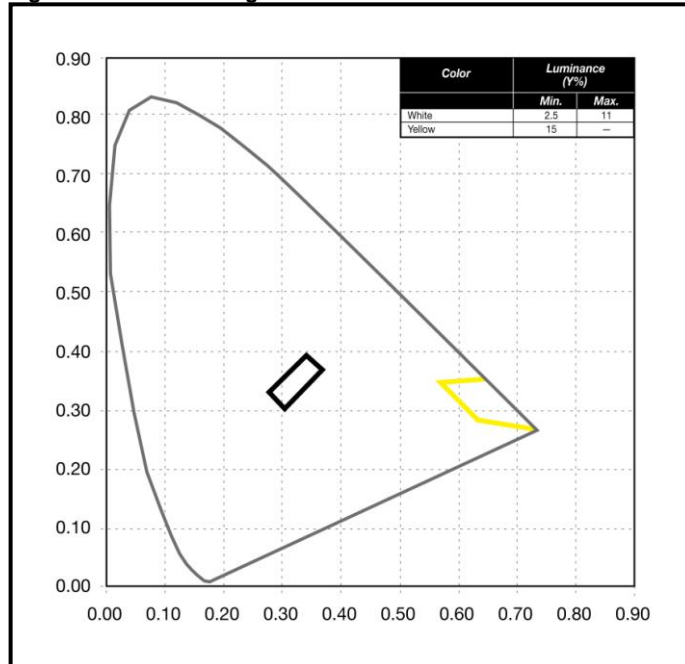
Minimum Coefficient of Retroreflection (R_A)¹

Observation Angle	Entrance Angle	Minimum	
		White	Yellow
0.2°	-4°	600	400
	30°	350	220
0.5°	-4°	160	100
	30°	75	45

Colors and Specification Limits:

V-9700RR **meets** the color and minimum luminance requirements² for FRA-224 (49 CFR 224) and ASTM D4956 Type V shown in **Figure A**.

Figure A: CIE Color Diagram



Avery Dennison V-9700RR Year meets the current applicable requirements for the following specifications:

FRA 224 (49 CFR 224)	US
ASTM D4956	North America

Avery Dennison suggests you obtain the current requirements from your local agency and ensure product conformance with such requirements. Your Avery Dennison Representative can assist you in this regard.

Avery Dennison V-9700RR Conspicuity Tape contains the FRA-224 certification seen in **Figure B**

Figure B



¹ R_A =
candelas per foot-candle per square foot
(cd/fc/ft²)

²The four pairs of chromaticity coordinates and luminance range in **Figure A** determine the acceptable color in terms of the CIE 1931 Standard Colorimetric System when measured with CIE Illuminant D65, 45°/0° geometry, and CIE 2 standard observer.

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Characteristics:

Property	Requirement	Series V-9700RR Typical Values	
Shelf-Life	NA	1 year from date of purchase when stored at the following conditions; 65°-75°F (18°-24°C) and 50% ± 5% R.H.	
Typical Film Caliper	NA	14 – 16 mils (355 – 407 µm)	
Min. Application Temperature	NA	0° F (-18° C)	
Service Temperature	NA	-10°F to +175°F (-23°C to + 80°C)	
Gloss ASTM D523 at 85°	NA	100	
Peel Adhesion PSTC-2 12in/min, 90° peel angle	Substrate	Degreased Aluminum	5.9 lb/in (1.05 kg/cm)
		Prepainted Panel	4.8 lb/in (0.86 kg/cm)
		Stainless Steel	6.7 lb/in (1.20 kg/cm)
Dimensional Stability* ASTM D4956	Less than 1/8" change on 9x9 panel	Pass	
Flexibility* ASTM D4956 Wrap around 0.125" mandrel @ 32° F (0°C)	No Cracking	Pass	
High Pressure Wash Test 45° angle, 1200 psi, 8 inch distance	No delamination, edge lift, cracking, or water penetration	Pass	
Adhesion* ASTM D4956 0.79kg 90° hanging weight	Less than 2" movement	Pass	
Chemical Resistance SAE J 1967 Immersion in diesel fuel, xylene/mineral spirits mixture, TSP solution	No softening, dulling, color change, or adhesion loss	Pass	
Corrosion Resistance ASTM B-117 5% salt spray for 1000 hours	No white corrosion, red rust, discoloration, delamination, flaking, checking, cracking, or blistering	Pass	
Impact Resistance Room Temp* ASTM D4956 Falling dart with 10 in-lb force and 5/8 inch tip at room temperature	No damage outside impact area	Pass	
Impact Resistance Cold Temp ASTM D4956 Falling dart with 10 in-lb force and 5/8" tip at -20°C	No damage outside impact area	Pass	

*FRA-224 and ASTM D4956 Requirement

The following Warranty is limited to North America.

WARRANTY:

Avery Dennison products are warranted to be free from defects in material and workmanship for one year from date of purchase. It is expressly agreed and understood that Avery Dennison's sole obligation and Purchaser's exclusive remedy under this warranty, under any other warranty, express or implied, or otherwise, shall be limited to repair or replacement of defective Product without charge at Avery Dennison's plant or at the location of Product (at Avery Dennison's election), or in the event replacement or repairs is not commercially practical, to Avery Dennison's issuing Purchaser a credit reasonable in light of the defect in the Product.

Avery Dennison further warrants that Avery Dennison® V-9700RR Series ("Products") will retain its effectiveness for its intended use ("Performance Warranty") as set forth in accordance with the following standards:

PERFORMANCE WARRANTY:

If within ten (10) years from the initial date of installation, the Product deteriorates due to natural causes to the extent that the Product is ineffective for its intended purpose when viewed from a moving vehicle under normal daytime or nighttime driving conditions, Avery Dennison will furnish a replacement amount of like Product at no cost to enable the installed surface to be restored to its original effectiveness.

CONDITIONS:

This warranty shall be effective only if all of the following conditions are met:

Fabrication and/or installation must occur within one (1) year from the date of purchase.

The failure must have resulted solely from a manufacturing defect or deterioration of the Product due to natural causes under the Performance Warranty. Without limiting the generality of the foregoing, there is no warranty for the failure of the sheeting due to improper fabrication, improper storage, handling, installation, maintenance, failure of the substrate, vandalism or mischief. Slight color fading, cracking, chalking, edge lifting, or slight reduction in gloss or reflectivity will not materially detract from appearance and does not constitute a breach of warranty.

Avery Dennison has published instructional bulletins pertaining to the storage, handling, and cleaning of Product, approved substrates, and application procedures (collectively, the "Procedures"). The Product must have been processed and applied to blank, clean material in accordance with the Procedures, as such may be amended from time to time. Avery Dennison reserves the right to reject any warranty claim where the fabricator or installer cannot satisfactorily prove or demonstrate that the Avery Dennison Procedures were utilized. The date of installation, warranty registration, and claim procedures established by Avery Dennison must be followed, and failure to follow such procedures shall void this warranty. Replacement Product carries only the unexpired warranty portion of the Product it replaces. The Product must be properly stored and applied within the shelf-life as stated in the applicable Avery Dennison Product Data Sheet including adhesive and other material product data sheets.

INDEPENDENT TESTING REQUIRED

All statements, technical information and recommendations about Avery Dennison products are based upon tests and information believed to be reliable but do not constitute a guarantee or warranty of any kind. All Avery Dennison products are sold with the understanding that Purchaser has independently determined the suitability of such products for its intended and other purposes.

THIS WARRANTY IS GIVEN IN LIEU OF ALL OTHERS. ANY AND ALL OTHER WARRANTIES, WHETHER EXPRESS OR IMPLIED, INCLUDING IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, ARE HEREBY DISCLAIMED. NO WAIVER, ALTERATION, ADDITION OR MODIFICATION OF THE FOREGOING CONDITIONS SHALL BE VALID UNLESS MADE IN WRITING AND MANUALLY SIGNED BY AN OFFICER OF AVERY DENNISON.

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Application Information:

The following Avery Dennison literature will provide information to the user for proper application, storage, and other requirements. Find the latest information on the Avery Dennison website, www.reflectives.averydennison.com. We encourage you to check our website periodically for updates.

Instructional Bulletins:

Substrate Requirements	#8.01
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Where to Apply:

Please check for any changes to local, state or Federal regulations that are relevant to Conspicuity Tape markings. For railroad freight cars, tank cars, flat cars and locomotives exemplary standards include section 106 from 49 CFR Part 224. Vertical or horizontal applications are described, including illustrations. The type of application required is dependent on the type of car.

Maintenance:

Regular cleaning is recommended to ensure maximum performance for vehicle identification day and night. The following cleaning methods are recommended.

- A.) By hand with a sponge, cloth, or other non-abrasive media using mild detergent and water.
- B.) Pressure washed according to the following parameters:
 - Maximum Pressure: 1200 psi
 - Maximum wash temperature: 140°F
 - Water jets must be a minimum of 12" from the Conspicuity Tape
 - Spray water jets at an angle of 90° (±45°) from the surface
 - Cleaning solution should have a pH of 3-11. Follow dilution ratios of cleaning solutions per manufacturer recommendations.

Substrates:

The application of Avery Dennison V-9700RR is limited to properly prepared metal and painted metal substrates. Users are urged to carefully evaluate, under actual use conditions, any film application to other substrates. For painted surfaces follow manufacturer's recommendations for drying and curing. Failure of film caused by other substrates, materials, contamination, or improper surface preparation is not the responsibility of Avery Dennison. See Instruction Bulletin #8.01 for full details on substrate requirements.

ADDITIONAL LIMITATIONS

Unintended Use: This warranty only applies to Product that is used by professional converters and installers for the defined end uses and in the combinations described in the applicable Avery Dennison Product Data Sheets and Instructional Bulletins. For any other use, the user is responsible for determining the suitability of the Product, and for any and all risk or liability associated with that use or application, and the user agrees to indemnify, defend and hold harmless Avery Dennison for any claims, losses, damages, judgments, expenses and/or expenses, including attorneys fees, resulting from such use or application. This warranty is expressly conditioned on the Product being processed by professional converters or installers in accordance with the Avery Dennison recommended written processing instructions, and being applied to properly prepared surfaces and cleaned and maintained in accordance with recommended Avery Dennison procedures. It is the converters, installers or other users responsibility to perform incoming raw material quality inspections, to assure proper surface preparation and that approved application procedures are followed, to retain converted samples, and to immediately cease using and notify Avery Dennison and/or its authorized agent or distributor of any Product, Materials and/or finished Product discovered to be (or reasonably capable of being discovered to be) defective.

Misuse and Force Majeure: Avery Dennison has no obligations or liability under this warranty with respect to Product that has been altered, modified, damaged, misused, abused, subject to accident, neglected or otherwise mishandled or improperly processed or installed. Product is not warranted against premature failure caused by chemical, environmental or mechanical means such as, but not limited to, vandalism, cleaning solutions, paints, solvents, moisture, temperature, mechanical washing equipment, engine fuel spills, engine exhaust, steam, organic solvents or other spilled chemicals pollutants, including industrial and volcanic ash. Damage from fire, structural failure, lightning, accidents and other force majeure events are not covered by this warranty.

Third Party Product: Avery Dennison assumes no responsibility for any injury, loss or damage arising out of the use of a product that is not of our manufacture. Where installer or converter uses or reference is made to a commercially available product, made by another manufacturer, it shall be the responsibility of the user, installer or converter to ascertain the precautionary measures for its use outlined by the manufacturer.

The remedies provided under this warranty are exclusive. In no event shall Avery Dennison be responsible for any direct, indirect, incidental or consequential damages or specific relief whether foreseeable or not, caused by defects in such Product, whether such damage occurs or is discovered before or after replacement or credit, and whether or not such damage is caused by Avery Dennison's negligence. In no event shall Avery Dennison's liability hereunder exceed the remedies specifically set forth in this warranty. Avery Dennison's liability shall be limited, at Avery Dennison's option, to the purchase price, replacement of the defective Product and in some cases when authorized by Avery Dennison the repair and replacement of the defective Product.

DEFINITIONS:

Durability: means that the Product used in a finished graphic, panel or sign situated outdoors, subject to the limitations herein and Avery Dennison Product Data Sheets and Instructional Bulletins, and applied to recommended surfaces, will not deteriorate excessively such that the finished sign, panel or graphic is ineffective for its identification when viewed under normal conditions from the intended viewing distance.

Outdoor Durability: is based on normal middle European and central North American outdoor exposure conditions and application to recommended surfaces. Actual performance life will depend on a variety of factors, including but not limited to substrate preparation, exposure conditions and maintenance of the Product and finished graphic, panel or sign. In case the finished graphics, panel or sign is in areas of high temperatures or humidity, in industrially polluted areas or other areas with air laden particulate matter and/or in high altitudes, Outdoor Durability may be reduced. Please see your local Avery Dennison representative for changes to warranties based on such localized conditions.

Vertical Exposure: means that the face of the finished graphic is ±10° from vertical.

Non-Vertical Exposure: means that the face of the finished graphic is greater than 10° from vertical and greater than 5° from horizontal. Retroreflective films are not warranted for this exposure.

Flat surfaces: means a two dimensional flat surface without protruding objects.

Weathering Effects: Some degradation of Product performance over time is considered normal wear. Slight color fading, chalking, edge lifting, or slight reduction in gloss or reflectivity due to normal wear and exposure and other natural weathering, environmental or other conditions or damage caused by tornadoes, hurricanes, wind, excessive ice buildup or extraordinary frozen particulate conditions, large hail stones or other acts of God, do not constitute a breach of warranty or give rise to any liability by Avery Dennison.

Printing, Curing and Ink Defects: Ink contaminations, failures or other defects, or other failures due to improper printing conditions or settings including, but not limited to, unsuitable color calibration, incorrect ICC color profiles or incompatible printing, do not constitute a breach of warranty. Product failure caused by ink over-saturation, excessive or under curing, failure of ink to render desired colors on Product, or other treatment or processing errors are not warranted.

Adhesion to Application Surfaces: This warranty does not cover the Product if the application surface is not properly prepared; nor does the warranty cover the Product or damage to the substrate because the layers of the substrate separate due to a lower bond between those layers than the bond between the Product and the top layer of the substrate, or surfaces which subsequently crack, peel, outgas, or become damaged beneath the Product

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