

Avery Dennison® T-5000 & W-5000 Series High Intensity Beaded Retroreflective Film

Issued: April 2011

Revision 1

Avery Dennison® T-5000 & W-5000 Series High Intensity Beaded Retroreflective Film for permanent and temporary traffic signage, is a high-quality, durable, encapsulated lens material with a pressure sensitive adhesive.

T-5000 & W-5000 Series sheeting is an Omni-Directional encapsulated beaded film. This feature benefits agencies by providing confidence that all signs will perform with uniform visual reflectivity at all sign face orientations.



Performance:
ASTM D4956 Type III
EN-12899 RA2
See Page 2 for complete list.



Orientation: Omni-Directional



Durability: 10 year
Vertical exposure only.



Face: High-Gloss Glass
Microspheres



Adhesive: Permanent
Pressure Sensitive



Liner: Polypropylene Film

Features:

- Omni-Directional
- Field proven long term durability on safety devices worldwide
- Uniform daytime and nighttime visual appearance

Conversion:

- Screen Printing
- Solvent Based Inkjet Printing
- Mild/Eco Solvent Inkjet Printing
- UV Inkjet Printing
- Thermal Die-Cut
- Flat Bed Sign-Cut
- Drum Roller Sign-Cut
- Steel Rule Sign-Cut

Applications:

- Permanent and Temporary Outdoor Signage
- Rigid Work Zone Devices

Product Availability*:

<i>Traffic Products</i>	
T-5500	White
T-5501	Yellow
T-5505	Blue
T-5507	Green
T-5508	Red
T-5509	Brown
<i>Work Zone Products**</i>	
W-5504	Orange

* See Page 5 for Nomenclature

** 3 Year Durability

Product Data Sheet

Page 1 of 7
Graphics and Reflective Solutions
250 Chester Street
Painesville, OH 44077



www.reflectives.averydennison.com

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Retroreflectivity:

Table A:
Min. coefficients of retroreflection (R_A)¹ per ASTM D4956² Type III

Observation Angle	Color	Entrance Angle	
		- 4°	+ 30°
0.1° ³	White	300	180
	Yellow	200	120
	Orange	120	72
	Blue	24	14
	Green	54	32
	Red	54	32
	Brown	14	10
0.2°	White	250	150
	Yellow	170	100
	Orange	100	60
	Blue	20	11
	Green	45	25
	Red	45	25
	Brown	12	8.5
0.5°	White	95	65
	Yellow	62	45
	Orange	30	25
	Blue	7.5	5.0
	Green	15	10
	Red	15	10
	Brown	5.0	3.5

Table B:
Min. coefficients of retroreflection (R_A)¹ EN-12899 RA2

α Observation Angle	Color	β_1 ($\beta_2=0^\circ$) Entrance Angle		
		+ 5°	+ 30°	+ 40°
12' (0.2°)	White	250	150	110
	Yellow	170	100	70
	Orange	100	60	29
	Blue	20	11	8.0
	Green	45	25	12
	Red	45	25	15
	Brown	12	8.5	5.0
20' (0.33°)	White	180	100	95
	Yellow	120	70	60
	Orange	65	40	20
	Blue	14	8.0	7.0
	Green	21	12	11
	Red	25	14	13
	Brown	8	5	3
2°	White	5.0	2.5	1.5
	Yellow	3.0	1.5	1.0
	Orange	1.5	1.0	--
	Blue	0.2	--	--
	Green	0.5	0.3	0.2
	Red	1.0	0.4	0.3
	Brown	0.2	--	--

T-5000 & W-5000 Series sheeting **exceeds** all values listed in **Table A** and **Table B**.

T-5000 & W-5000 Series sheeting also **exceeds** the current applicable requirements for the following specifications:

ASTM D4956	International
AASHTO M268	USA
EN-12899	EU
GB/T 18833	China
N-CMT-5-03-001	Mexico
UNE 135334	Spain
NF XP98520	France
BSI 8408	UK
UNI 11122	Italy
JIS Z9117	Japan
SANS 1519-1	South Africa
AS/NZS 1906.1	Australia New Zealand
ABNT NBR 14644	Brazil
IRAM 10 033	Argentina

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.

¹ R_A =
candelas per foot-candle per square foot (cd/ft²) OR
Candelas per lux per square meter (cd/lx/m²)

² Measured according to ASTM E810

³ Note that 0.1° Observation angle is a "supplemental Requirement" in ASTM D4956. It represents long highway viewing distances of about 900 ft (275 Meters) and greater.

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Colors and Specification Limits:

Figure A: Daytime Color – CIE Color Diagram

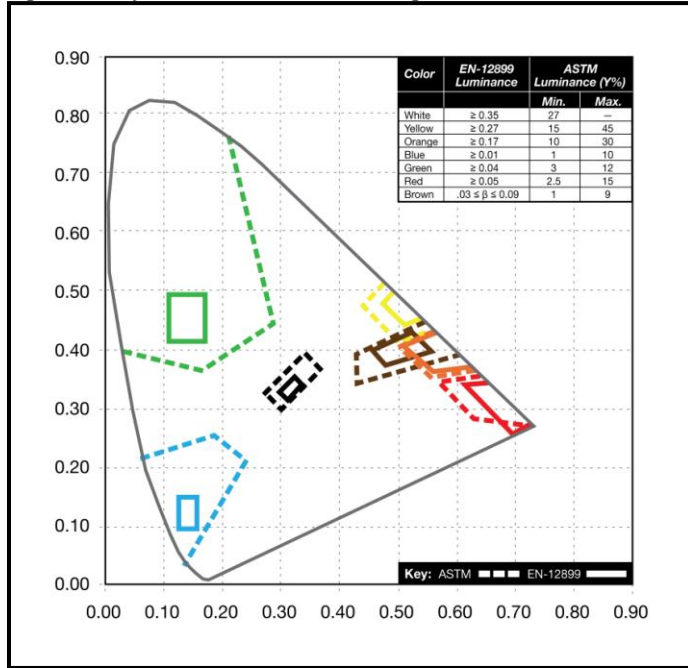
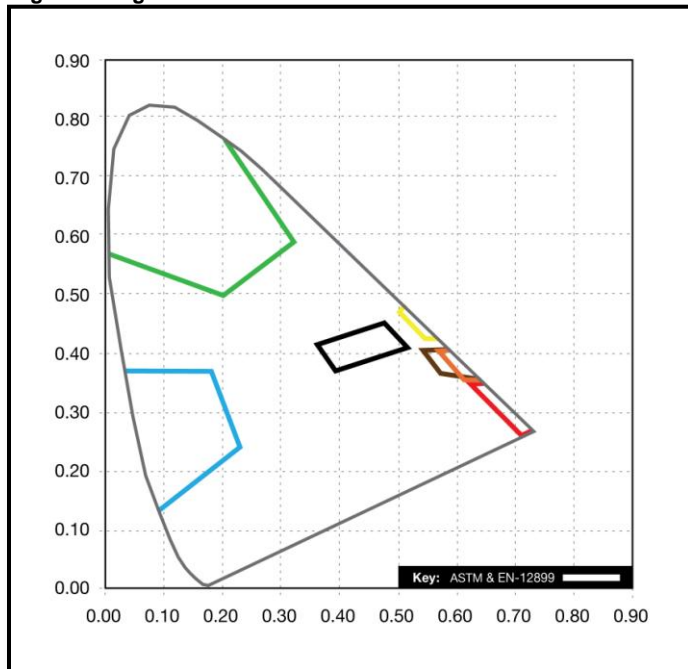


Figure B: Nighttime Color



T-5000 & W-5000 Series sheeting **meets** the current applicable daytime and nighttime color requirements for ASTM D4956 and EN-12899 as well as standards listed on Page 2.

Chromaticity Coordinate Limits

Figures A & B show the four pairs of chromaticity coordinates from ASTM D4956 and EN-12899 on the color grid.

Daytime Color

The four pairs of chromaticity coordinates in **Figure A** determine the acceptable color in terms of the CIE 1931 Standard Colorimetric System measured with Standard Illuminant D65 and CIE Publication no. 15 using CIE Standard Illuminant D65 and CIE 45/0 geometry. Luminance factor shall comply with table in **Figure A**.

Note: The saturation limit of green and blue may extend to the border of the CIE chromaticity locus for spectral colors

Nighttime Color

The four pairs of chromaticity coordinates in **Figure B** determine the acceptable color measured using CIE Illuminant A, observation angle of 0.33 degrees, entrance angle of +5 degrees, source and receiver apertures not to exceed 10 minutes of arc, and CIE 1930 (2 degree) standard observer per ASTM D4956.

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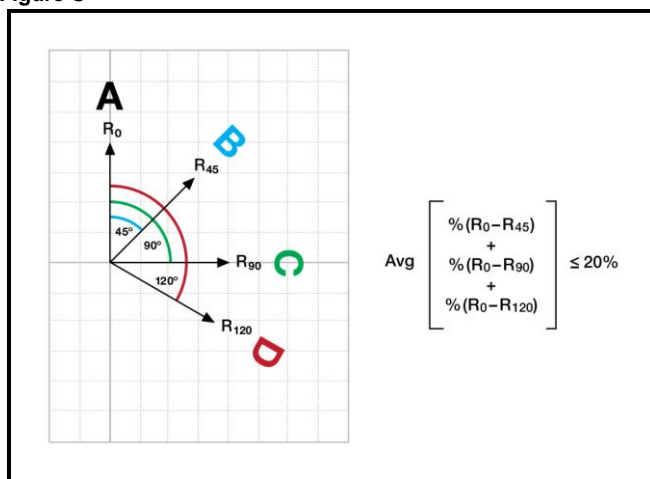
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Sheeting Orientation:

The American Association of State Highway Transportation Officials (AASHTO) has recognized that some retroreflective films are rotationally (orientation) sensitive. Because this impacts sign luminance, AASHTO has defined a specification to measure orientation performance. **Figure C** shows how the orientation sensitivity is measured. In order for a film to be considered rotationally insensitive, the average percent difference (shown in **Figure C**) must be less than or equal to 20%.

Figure C



When measured for orientation sensitivity as described in AASHTO M 268-10, all Avery Dennison sheeting, both beaded and prismatic, **pass** the specification as **rotationally insensitive**. Therefore, no special identification marks or other features (such as a datum mark, or distinctive seal pattern) are required to denote optimum orientation for sheeting. Because the user can expect visual uniformity regardless of orientation, no costly and cumbersome fabrication techniques are required to orient sheets, cut sign legend or border tape during sign fabrication.

Specifying agencies and sign fabricators are cautioned that some retroreflective sheetings, even of the same ASTM "Type" may not provide consistent luminance for desired night visibility if the sheeting is not applied in the optimal, or in uniform orientation. Agencies and fabricators should be aware of this concern and discuss the potential effects of rotation on luminance of specific sheetings with their material supplier before beginning installation and/or fabrication.

T-5500 & W-5500 Series sheeting is Omni-Directional and **passes** the AASHTO specification as being **rotationally insensitive**.

Retroreflectivity R_A values taken per ASTM E810
0.5° Observation angle and
-4° or 5° Entrance angle

As a datum for laboratory measurements R_0 is identified in the crossweb direction.

*Watermark**: T-5500 & W-5500 Series does not have a watermark.

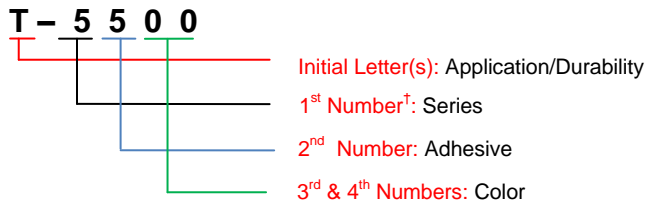
*May vary by region.

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Nomenclature:



Initial Letter	Application	Durability*
T	Traffic/Permanent Sheeting	10 year
W	Work Zone Sheeting	3 year
WR	Work Zone Reboundable	3 year

* See your local representative for complete details.

Series	5000
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2 nd Number	Substrate
1	Pressure Sensitive for Plastic Substrates
2	Pressure Sensitive for Wood Substrates
5	Pressure Sensitive for Aluminum Substrates

3 rd & 4 th Numbers	Color
00	White
01	Yellow
04	Orange
05	Blue
07	Green
08	Red
09	Brown
11	Fluorescent Yellow
13	Fluorescent Yellow-Green
14	Fluorescent Orange
42	4" LEFT Orange Pre-Striped Barricade
43	4" RIGHT Orange Pre-Striped Barricade
44	6" LEFT Orange Pre-Striped Barricade
45	6" RIGHT Orange Pre-Striped Barricade

†OmniCube is the exception and leads with the number 11

WARRANTY

Avery Dennison T-5000 & W-5000 beaded retroreflective sheeting ("product(s)") are warranted to be free from defects in material and workmanship for one (1) year from date of purchase (or the period stated on the specific product information literature in effect at time of delivery, if longer). 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.

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 sign fabrication, storage, handling, installation, maintenance, failure of the sign 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.

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Characteristics:

<i>Property</i>	<i>Value</i>	<i>Instructional Bulletins</i>
Shelf-Life	1 year from date of purchase when stored at the following conditions; 65°-75°F (18°-24°C) and 50% ± 5% R.H.	#8.00
Typical film Caliper	11 – 12 mils (279 – 305µ)	NA
Min. Application Temperature	65° F (18° C)	#8.10
Service Temperature	-10°F to +150°F (-23°C to + 65°C)	#8.00
Screen Printing	Long term durability of screen printing in combination with T-5000 & W-5000 is warranted when used with approved inks and overlays. See Page 7.	#8.30 #8.55
Inkjet Printing	User assumes responsibility for fitness of use for this converting method. Long term durability of inkjet printing in combination with T-5000 & W-5000 series is not warranted.	#8.55

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.

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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Converting 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.

Approved screen printing inks, overlays, thermal transfer ribbons:

Supplier	Series	System	Instructional Bulletins
Avery Dennison	4930 Inks	1 Part Solvent	#8.40
Avery Dennison	UVTS Nazdar	UV	#8.38
Avery Dennison	OL-2000	Acrylic Overlay	#8.01, #8.10, #8.25
Avery Dennison	OL-1000	Anti-Graffiti	#8.01, #8.10
Matan	DTS	Thermal Transfer	#8.60

Instructional Bulletins:

Film Care & Handling	#8.00
Substrate Requirements	#8.01
Application Techniques for PS Film	#8.10
Cutting Methods	#8.20
Computer Sign Cutting	#8.25
Screen Preparation	#8.30
Troubleshooting Printing & Processing	#8.34
UVTS Nazdar Inks	#8.38
4930 Series Inks	#8.40
Ink Recommendations Guide	#8.55

Substrates:

The application of Avery Dennison T-5000 & W-5000 Series sheeting is limited to properly prepared s Aluminum. Users are urged to carefully evaluate, under actual use conditions, any film application to other substrates. 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.

DEFINITIONS

Durability: means that the Product 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 $\pm 10^\circ$ 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 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 profile 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

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.

If any court of competent jurisdiction or relevant government agency holds any provision of this warranty and limitation of liability to be illegal, void, invalid or unenforceable, whether in terms of any competition, legislation or otherwise, such provision shall be deleted and severable from this warranty and limitation of liability but deletion shall not affect the validity or enforceability of any other provisions hereof.

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