Avery Dennison® WR-7100 Series
Reboundable Microprismatic Retroreflective Film

Issued: July 2013

Avery Dennison® WR-7100 Series Reboundable High Intensity Microprismatic Retroreflective Film for Work Zone traffic signage, is a high-quality, durable, microprismatic retroreflective material with a pressure sensitive adhesive for use on reboundable plastic drums and other work zone devices. Its unique microprismatic construction provides a high level of retroreflectivity for demanding traffic control situations.

WR-7100 Series sheeting is an Omni-Directional microprismatic film that incorporates tiles of microprisms arranged in multiple orientations. This feature – "Smart at Every Angle" benefits agencies by providing confidence that all signs will perform with uniform reflectivity at all sign face orientations.

Performance:
ASTM D4956 Type VIII,
EN-12899 Class 2
See Page 2 for complete list.

Orientation: Omni-Directional

Durability: 3 year
Vertical Exposure only

Face: High Gloss PVC & Acrylic Retroreflective Film with Microprisms

Adhesive: Permanent Pressure Sensitive, Plastic

Liner: Clear PET Film

Features:

- Omni-Directional
- High Intensity Microprismatic Retroreflective Performance
- Field proven long term durability on safety devices worldwide
- Uniform daytime and nighttime visual appearance

Conversion:

☒ Screen Printing
☒ Eco Solvent Inkjet Printing
☒ Flat Bed Sign-Cut
☒ Drum Roller Sign-Cut
☒ Steel Rule Sign-Cut

Product Availability*:

Work Zone Products	
WR-7100	White
WR-7114	Fluorescent Orange

*See Page 5 for Nomenclature

Applications:

☒ Work Zone Devices

Reflective Solutions
7542 North Natchez Ave.
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Retroreflectivity:

Table A:
Min. coefficients of retroreflection (R_A)[1] per ASTM D4956[2] Type IV

Observation Angle	Color	Entrance Angle	
		- 4°	30°
0.1°[3]	White	500	240
	Fluorescent Orange	150	70
0.2°	White	360	170
	Fluorescent Orange	105	50
0.5°	White	150	72
	Fluorescent Orange	45	22

Table B:
Min. coefficients of retroreflection (R_A)[1] EN 12988RA2

α Observation Angle	Color	β1 (β2=0˚) Entrance Angle		
		+ 5°	+ 30°	+ 40°
12'	White	250	150	110
	Fluorescent Orange	75	45	33
20'	White	180	100	95
	Fluorescent Orange	54	30	28.5
2°	White	5	2.5	1.5
	Fluorescent Orange	1.5	--	--

WR-7100 Series sheeting **exceeds** all values listed in **Table A** and **Table B.**

WR-7100 Series sheeting also **exceeds** the current applicable requirements for the following specifications:

ASTM D4956	International
AASHTO M268	USA
CUAP	EU
GB/T 18833	China
N-CMT-5-03-001	Mexico
UNE 135340	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 3952	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/fc/ft^2) OR Candelas per lux per square meter (cd/lx/m^2)

[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

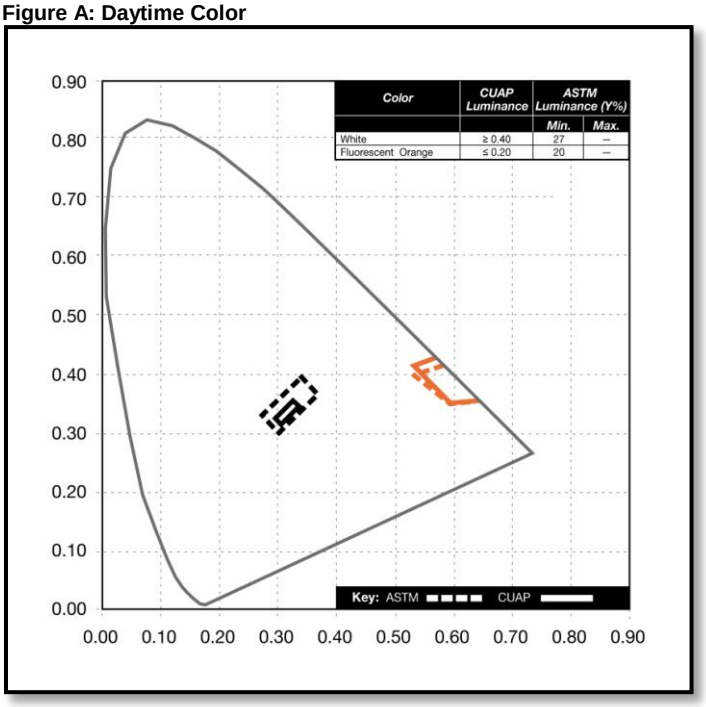
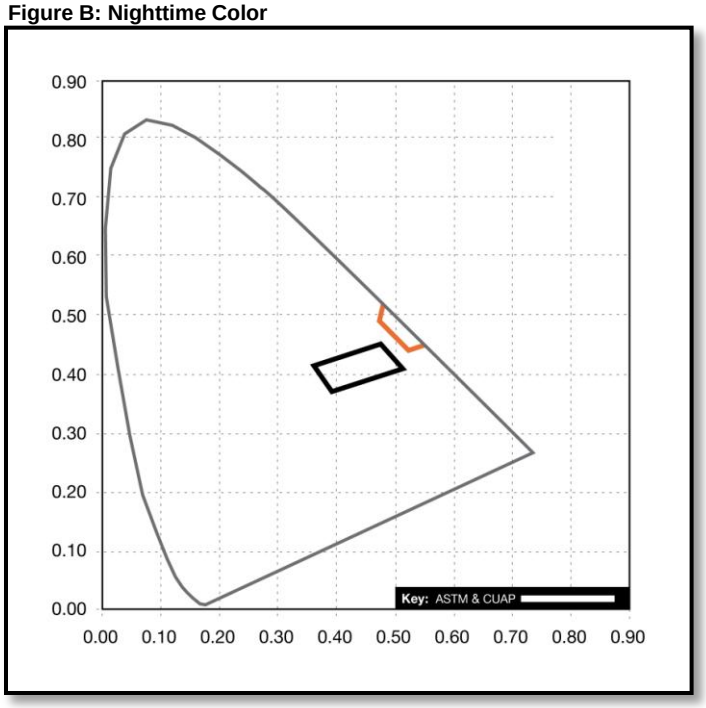


Figure B: Nighttime Color



WR-7100 Series sheeting **meets** the current daytime and nighttime color requirements for ASTM D4956 and CUAP as well as all standards listed on Page 2.

Chromaticity Coordinate Limits

Figures A & B show the four pairs of chromaticity coordinates from ASTM D4956 and EN 12889 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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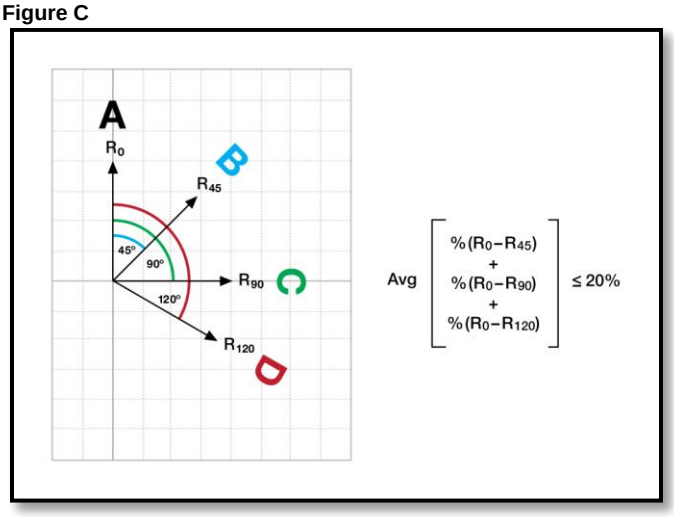
Sheeting Orientation:

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.

WR-7100 Series sheeting is Omni-Directional and **passes** the AASTHO 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: WR-7100 Series does not have a watermark, but can be identified by a shell pattern.

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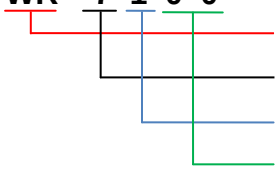
Nomenclature:

WR – 7 1 0 0



Initial Letter(s): Application/Durability

1st Number(s) †: Series

2nd Number: Adhesive

3rd & 4th Numbers: Color

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	7100

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

3rd & 4th 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

The following Warranty is limited to North America.

WARRANTY

Avery Dennison WR-7100 microprismatic reflective 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.

Avery Dennison further warrants that Avery Dennison® WR-7100 microprismatic reflective sheeting will retain its effectiveness as a component of traffic control and guidance signs, and will meet the stated minimum values for coefficient of retroreflection (“Performance Warranty”) as set forth in accordance with the following standards:

Warranty Period	Minimum Percentage R_A Retained
1-3 years	80%

R_A percentage retained above apply to all entrance and observation angles in Table A, and shall be measured per ASTM E 810.

All measurements shall be made after cleaning according to Avery Dennison procedures.

PERFORMANCE WARRANTY

If within three (**3**) years of installation such deterioration occurs or the Product fails to retain the minimum three (**3**) year reflectivity values, Avery Dennison will restore the installation surface to its original effectiveness at no cost for materials or labor.

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:

Property	*Value*	*Instructional Bulletins*
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	16.5 – 17.5 mils (419 – 445µ)	NA
Min. Application Temperature	65° F (18° C)	#8.10
Service Temperature	-10°F to +150°F (-23°F to + 65°C)	#8.00
Screen Printing	Long term durability of screen printing in combination with WR-7100 Series sheeting is warranted when used with approved inks and overlays. See Page 7.	#8.30 #8.55
Eco Solvent Inkjet Printing	Long term durability of inkjet printing in combination with HIP series sheeting is warranted when used with approved inks and printer systems. See Page 7.	#8.61

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
Avery Dennison	TrafficJet™ 1638 – 8 Color	Eco Solvent Inkjet*	#8.61

*Warranted for black ink on 3 year durable work zone applications. Clear overlay not required.

Instructional Bulletins:

Film Care & Handling	#8.00
Substrate Requirements	#8.01
Application of Reboundable Film	#8.03
Application Techniques for PS Film	#8.10
Steel Rule & Thermal Die-Cutting	#8.20
Sign Cutting	#8.25
Screen Preparation	#8.30
Troubleshooting Printing & Processing	#8.34
UVTS Nazdar Ink	#8.38
4930 Series Ink	#8.40

Substrates:

The application of Avery Dennison WR-7100 Series sheeting is limited to properly prepared HDPE & LDPE plastic drum substrates. Smooth, dry and flame treated surfaces will allow for the best permanent bond. 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 ±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 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.

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