

3M™ Window Film

Specifications

Specifications For 3M Safety and Security Window Film Ultra Series

1.0 Scope

This specification is for a shatter resistant and abrasion resistant window film which when applied to the interior window surface will help hold broken glass together and reduce the ultra-violet light that normally would enter through the window. Sun Control types additionally will provide heat and glare reduction. The film shall be called 3M™ Safety and Security Window Film Ultra Series.

2.0 Applicable Documents

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only. The 1985 American Society for Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE) Handbook of Fundamentals.

The American National Standards Institute (ANSI).

ANSI Z97 Specification for Safety Glazing Material used in Buildings

Sec 5.1 Impact Test: 100-ft/lb. minimum

Sec 5.3 Intensified Weathering

The American Society for Testing and Materials (ASTM) publication:

- ASTM E-308 Standard Recommended Practice for Spectrophotometry and Description of Color in CIE 1931 System
- ASTM E-903 Standard Methods of Test for Solar Absorbance, Reflectance and Transmittance of Materials Using Integrating Spheres
- ASTM D-1044 Standard Method of Test for Resistance of Transparent Plastics to Surface Abrasion (Taber Abrader Test)
- ASTM G-90 Standard Practice for Performing Accelerated Outdoor Weathering for Non-metallic Materials Using Concentrated Natural Sunlight
- ASTM E-84 Standard Method of Test for Surface Burning Characteristics of Building Materials
- ASTM D-1004 Standard Method of Test for Resistance of Transparent Plastics to Tearing (Graves Tear Test)
- ASTM F-1642-96 Standard Method of Test for Glazing and Glazing Systems Subject to Airblast Loadings, as adapted by the U.S. Government GSA Test Standard Protocols

The Consumer Products Safety Commission (CPSC) CFR16, Part 1201 Safety Standards for Architectural Glazing Material

Impact Performance

Accelerated Weathering

Window 4.1. A Computer Tool for Analyzing Window Thermal Performance, Lawrence Berkeley Laboratory

3.0 Requirements of the Film

3.1 Film Material - Clear: The film material shall consist of an optically clear micro-layered polyester film (Ultra S150 (SCLARL150)), laminated to another clear micro-layered polyester film (Ultra S400 (SCLARL400)), and again laminated to a third micro-layered polyester film (ULTRA600), with a durable acrylic abrasion resistant coating over the surface. The film color is clear and will not contain dyed polyester. The film shall have a nominal thickness of ____ mils (____ inches). There shall be no evidence of coating voids. The film shall be identified as to Manufacturer of Origin (hereafter to be called Manufacturer).

Or

3.1 Film Material - Sun Control: The film material shall consist of an optically clear multi-layered polyester film laminated to a metallized multi-layered polyester film (Ultra Silver S20 (S20SIAR400), Ultra Neutral S35 (S35NEAR400), Ultra Neutral S50 (S50NEAR400)), with a durable acrylic abrasion resistant coating over the surface. The film color is derived from the metal coating and the product will not contain dyed polyester. The metallic coating shall be uniform without noticeable pinholes, streaks, thin spots, scratches or banding. The film shall have a nominal thickness of ____ mils (____ inches). There shall be no evidence of coating voids. The film shall be identified as to Manufacturer of Origin (hereafter to be called Manufacturer).

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3.1 Film Material - Ultra Night Vision: The film material shall consist of an optically clear multilayered polyester film laminated to a metallized multi-layered polyester film. Another film layer is added for color and performance (Ultra Night Vision S25 (S25NVAR400)), with a durable acrylic abrasion resistant coating over the surface. The film color is derived from the metal coating and additional layer and is stable. The metallic coating shall be uniform without noticeable pinholes, streaks, thin spots, scratches or banding. The film shall have a nominal thickness of ____ mils (____ inches). There shall be no evidence of coating voids. The film shall be identified as to Manufacturer of Origin (hereafter to be called Manufacturer).

3.2 Emissivity: The emissivity of the non-adhesive surface of the film shall be ____ nominal when measured using a Devices & Services Emissometer Model AE at or near room temperature. The Manufacturer shall provide laboratory data of emissivity and calculated window "U" Values for various outdoor temperatures based upon established calculation procedure defined by the 1985 ASHRAE Handbook of Fundamentals, Ch. 27., or Lawrence Berkeley Laboratory Window 4.0 Computer Program.

3.3 U Value: The U Value of the film applied to 1/4" (6mm) clear glass shall be ____ nominal when measured in accordance with test procedures described in 3.2 for Emissivity.

3.4 Transmission - Visible: When applied to 1/4" (6mm) clear glass, the luminous transmittance shall be ____ nominal when measured with an integrating sphere spectrophotometer as referenced by ASTM E-903 and calculated per ASTM E-308 using Standard Source "C" for average daylight.

3.5 Reflection - Visible: When applied to 1/4" (6mm) clear glass, the total luminous reflection from the glass surface shall be ____ nominal when measured with an integrating sphere spectrophotometer as referenced by ASTM E-903 and calculated per ASTM E-308 using Standard CIE Source "C" for average daylight.

3.6 Transmission - Ultraviolet Light: When applied to 1/4" (6mm) clear glass, the total transmission of solar ultraviolet radiation of air mass = 2 over the spectral range of 3000 to 3800 angstroms shall not exceed ____ when measured with an integrating sphere spectrophotometer as referenced by ASTM E-903.

3.7 Shading Coefficient: When applied to 1/4" (6mm) clear glass, the shading coefficient shall be ____ nominal when solar energy transmittance and reflection are measured per ASTM E-903 and the shading coefficient is computed in accordance with the established procedures defined by The ASHRAE Handbook of Fundamentals.

3.8 Adhesive System: The film shall be supplied with a high mass pressure sensitive weatherable acrylate adhesive applied uniformly over the surface opposite the abrasion resistant coated surface. A water soluble detackifier shall be incorporated over the pressure sensitive adhesive to facilitate handling. The adhesive shall be essentially optically flat and shall meet the following criteria:

- a. Viewing the film from a distance of ten feet at angles up to 45 degrees from either side of the glass, the film itself shall not appear distorted.
- b. It shall not be necessary to seal around the edges of the applied film system with a lacquer or other substance in order to prevent moisture or free water from penetrating under the film system.

3.9 Flammability: The Manufacturer shall provide independent test data showing that the window film shall meet the requirements of a Class A Interior Finish for Building Materials for both Flame Spread Index and Smoked Development Values per ASTM E-84.

3.10 Abrasion Resistance: The Manufacturer shall provide independent test data showing that the film shall have a surface coating that is resistant to abrasion such that, less than 5% increase of transmitted light haze will result in accordance with ASTM D-1044 using 100 cycles, 500 grams weight, and the CS10F Calbrase Wheel.

3.11 Tear Resistance: The film shall meet a minimum tear resistance value of ____ (lbs. x %) when measured in accordance with ASTM D-1004 (Graves Area Tear Test) at 20 inches/minute (508 mm/minute).

3.12 Safety Glazing: The film, when applied to either side of the window glass, shall pass a ____ ft/lb. impact when tested according to CPSC CFR16, Part 1201 and shall pass the accelerated weathering test requirements for both tensile strength and peel strength.

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3.13 Large Scale Explosive Blast Testing: The film, when applied to 1/4-inch (6 mm) glass shall meet a minimum performance level of 3 when open-air blast tested to a minimum of 4.0 PSI with 25/msp peak-over pressure and tested according to GSA Test Standard Protocols. This is an adaptation of ASTM F1642-96.

3.14 Tensile Strength: The film shall have an average tensile strength of 30,000 PSI when tested in accordance with ASTM D882-95a.

3.15 Young's Modulus (PSI): The film shall have a Young's Modulus of no greater than 500,000 PSI when tested in accordance with ASTM D-882-95a

3.16 PPT (Puncture Propagation Tear): The film shall have an average PPT value of _____ lbs. when tested in accordance with ASTM D-2582-93.

3.17 Elongation: The film shall have an average elongation of 140% when tested in accordance with ASTM D-2582-95a.

3.18 Break Strength (1 inch per width): The film shall have average break strength of 30 lbs. per mil of film thickness.

4.0 Requirements of the Authorized Dealer/Applicator (ADA)

4.1 The ADA shall provide documentation that the ADA is certified by the Manufacturer of the window film to install said window film as per the Manufacturer's specifications and in accordance with specific requests as to be determined and agreed to by the customer.

4.2 Authorization of dealership may be verified through the company's 3M ID Number.

4.3 The ADA will provide a commercial building reference list of ten (10) properties where the ADA has installed window film. This list will include the following information:

- * Name of building
- * The name and telephone number of a management contact
- * Type of glass
- * Type of film
- * Amount of film installed
- * Date of completion

4.4 Upon request, the ADA will provide a Glass Stress Analysis of the existing glass and proposed glass/film combination as recommended by the film Manufacturer.

4.5 Upon request, the ADA will provide an application analysis to determine available energy cost reduction and savings.

5.0 Requirements of the Manufacturer

5.1 The Manufacturer will insure proper quality control during production, shipping and inventory, clearly identify and label each film core with the product designation and run number.

5.2 The Manufacturer will, upon request and pre-approval, provide 100% financing for the complete installation of the window film to the end-user customer in either an installment purchase or lease purchase format to be decided upon by customer.

5.3 Materials shall be manufactured by:

3M Renewable Energy Division
3M Center, Building 235
St. Paul, MN 55144-1000

6.0 Application

6.1 Examination: Examine glass surfaces to receive new film and verify that they are free from defects and imperfections, which will affect the final appearance. Correct all such deficiencies before starting film application.

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6.2 Preparation:

- a. The window and window framing will be cleaned thoroughly with a neutral cleaning solution. The inside surface of the window glass shall be bladed with industrial razors to insure the removal of any foreign contaminant's.
- b. Toweling or other absorbent material shall be placed on the window sill or sash to absorb moisture accumulation generated by the film application.

6.3 Installation: The film shall be applied as to the specifications of the Manufacturer by an ADA.

- a. Materials will be delivered to the job site with the manufacturer's labels intact and legible.
- b. To minimize waste, the film will be cut to specification utilizing a vertical dispenser designed for that purpose. Film edges shall be cut neatly and square at a uniform distance of 1/8" (3 mm) to 1/16" (1.6 mm) of the window-sealing device.
- c. Clear, clean water will be used to remove the water soluble overcoat that protects the pressure sensitive adhesive. Water and film slip solution only will be used on the window glass to facilitate the proper positioning of the film.
- d. To insure efficient removal of excess water from the underside of the film and to maximize bonding of the pressure sensitive adhesive, polyplastic bladed squeegees will be utilized.
- e. Upon completion, the film shall have a dimpled appearance from residual moisture. Said moisture shall, under reasonable weather conditions, dry flat with no moisture dimples within a period of 30 calendar days when viewed under normal viewing conditions.
- f. After installation, any left over material will be removed and the work area will be returned to original condition. Use all necessary means to protect the film before, during and after the installation.

7.0 Cleaning

The film may be washed using common window cleaning solutions, including ammonia solutions, 30 days after application. Abrasive type cleaning agents and bristle brushes, which could scratch the film, must not be used. Synthetic sponges or soft cloths are recommended.

8.0 Warranty

8.1 The application shall be warranted by the film manufacturer (3M) for a period of ten (10) years in that the film will maintain solar reflective properties without cracking, crazing, delaminating, peeling, or discoloration. In the event that the product is found to be defective under warranty, the film manufacturer (3M) will replace such quantity of the film proved to be defective, and will additionally provide the removal and reapplication labor free of charge.

8.2 The film manufacturer (3M) also warrants against glass failure due to thermal shock fracture of the glass and/or seal failure of the window unit (maximum value \$500 per window) provided the film is applied to recommended types of glass and the failure occurs within sixty (60) months from the start of application. Any glass failure or seal failure must be reviewed by the film manufacturer (3M) prior to replacement.

Title - Clear

	Ultra S150 (SCLARL150)	Ultra S400 (SCLARL400)	Ultra S600 (Ultra600)	
1.0	Scope			
3.1	Thickness (mils) (inches)	2.0 0.0020	4.0 0.0040	6.0 0.0060
3.2	Emissivity	0.87	0.87	0.87
3.3	U Value	1.09	1.09	1.09
3.4	Transmission – Visible	87%	88%	85%
3.5	Reflection – Visible	11%	11%	10%
3.6	Transmission – Ultraviolet	<2%	<2%	<2%
3.7	Shading Coefficient	0.92	0.91	0.90
3.11	Tear Resistance	>350 lbs%	>780 lbs %	>1150 lbs %
3.12	Safety Glazing	150 ft/lbs Category 1	400 ft/lbs Category II	400 ft/lbs Category II
3.13	Air Blast Testing-Minimum Level 3 @ 4.0 PSI	N/A	Yes	Yes
3.14	Tensile Strength	30,000 PSI	30,000 PSI	30,000 PSI
3.15	Young's Modulus	<500k PSI	<500k PSI	<500k PSI
3.16	PPT (Puncture Propagation Tear)	2.0 lbs	7.5 lbs	19.2 lbs
3.17	Elongation	140%	140%	140%
3.18	Break Strength (Per inch width)	60 lbs	120 lbs	180 lbs

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Title – Sun Control

		Ultra Silver S20 (S20SIAR400)	Ultra Neutral S35 (S35NEAR400)	Ultra Neutral S50 (S50NEAR400)	Ultra Night Vision S25 (S25NVAR400)
1.0	Scope				
3.1	Thickness (mils) (inches)	4.0 0.0040	5.0 0.0050	5.0 0.0050	5.0 0.0050
3.2	Emissivity	0.79	0.87	0.87	0.72
3.3	U Value	1.02	1.09	1.09	0.82
3.4	Transmission – Visible	19%	37%	51%	24%
3.5	Reflection – Visible	58%	20%	15%	28%
3.6	Transmission – Ultraviolet	<1%	<1%	<1%	<1%
3.7	Shading Coefficient	0.26	0.51	0.66	0.43
3.11	Tear Resistance	>780 lbs%	>780 lbs %	>780 lbs %	>780 lbs %
3.12	Safety Glazing	400 ft/lbs Category I	400 ft/lbs Category II	400 ft/lbs Category II	400 ft/lbs Category II
3.13	Air Blast Testing-Minimum Level 3 @ 4.0 PSI	Yes	Yes	Yes	Yes
3.14	Tensile Strength	30,000 PSI	30,000 PSI	30,000 PSI	30,000 PSI
3.15	Young's Modulus (PSI)	<500k PSI	<500k PSI	<500k PSI	<500k PSI
3.16	PPT (Puncture Propagation Tear)	7.5 lbs	7.5 lbs	7.5 lbs	7.5 lbs
3.17	Elongation	140%	140%	140%	140%
3.18	Break Strength (Per inch width)	120 lbs	120 lbs	120 lbs	120 lbs

		Ultra PR S50	Ultra PR S70
1.0	Scope		
3.1	Thickness (mils) (inches)	6.0 0.0060	6.0 0.0060
3.2	Emissivity	0.79	0.87
3.3	U Value	1.02	1.00
3.4	Transmission – Visible	50%	68%
3.5	Reflection – Visible	08%	11%
3.6	Transmission – Ultraviolet	<1%	<1%
3.7	Shading Coefficient	0.51	0.58
3.11	Tear Resistance	>780 lbs%	>780 lbs %
3.12	Safety Glazing	400 ft/lbs Category II	400 ft/lbs Category II
3.13	Air Blast Testing-Minimum Level 3 @ 4.0 PSI	Yes	Yes
3.14	Tensile Strength	30,000 PSI	30,000 PSI
3.15	Young's Modulus (PSI)	<500k PSI	<500k PSI
3.16	PPT (Puncture Propagation Tear)	7.5 lbs	7.5 lbs
3.17	Elongation	140%	140%
3.18	Break Strength (Per inch width)	120 lbs	120 lbs

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