

3M™ Safety & Security Window Film





Ultra S400 (SCLARL400)

Technical Data

Product Features & Benefits

- Microlayered construction for increased tear resistance compared to conventional window films
- Optically clear, 4-mil (0.10 mm) thick film for application to interior glass surface
- Provides shatter resistance to protect from broken glass hazards caused by seismic activity, spontaneous glass breakage, and other impact events
- Broad range of application use, including bomb blast mitigation, windstorm protection, and safety glazing
- Can be combined with 3M Impact Protection Attachment systems for additional safety and security
- Exhibits strong adhesion to glass and shock absorbing properties
- Protective hardcoat provides scratch resistance and durability
- Protects from the harmful effects of UV light and reduces fading of interior furnishings

Product Performance & Technical Data

Ultra S400								
	Single Pane		Tinted		Double Pane		Double tinted	
Film	1/4" Clear	Ultra S400	1/4" tint	Ultra S400	Dual 1/4" Clear	Ultra S400	Dual 1/4" tint	Ultra S400
Solar Heat Gain Coefficient	0.82	0.79	0.63	0.59	0.70	0.68	0.51	0.46
Visible Light Transmitted	89%	86%	53%	47%	79%	75%	47%	42%
Visible Light Reflected Interior	9%	11%	6%	6%	15%	18%	13%	8%
Visible Light Reflected Exterior	8%	11%	6%	6%	15%	18%	8%	8%
U Value	1.03	1.03	1.03	1.03	0.47	0.47	0.47	0.47
UV Block	38%	98%	NA	99%	NA	99%	NA	99%
Total Solar Energy Rejected	19%	21%	37%	41%	30%	32%	49%	54%
Glare Reduction	NA	3%	NA	11%	NA	5%	NA	11%
Heat Loss Reduction	NA	0%	NA	0%	NA	0%	NA	0%
Solar Heat Reduction	NA	3%	NA	6%	NA	3%	NA	9%

Film Properties* (nominal)

Product	Film Thickness	Number of Layers	Tensile Strength	Break Strength	Elongation at Break	Graves Area Tear Resistance	Puncture Propagation Tear Resistance	Young's Modulus	Abrasion Resistance
Ultra S400	0.004"	28	30,000 psi	120 lbs/in	>125 %	780 lbs%	7.5 lbf	<500 kpsi	< 5% haze increase

*not for specification purposes

Important:

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Specifications

3M Ultra S400 Safety and Security Window Film

1.0 Scope

This specification is for an optically clear glass 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. This is an easily applied, tear-resistant safety and security window film that is useful for increased measure of protection in a broad range of applications, including basic glass fragment retention, spontaneous glass breakage, seismic preparedness, and safety glazing applications, protection from windborne debris, and bomb blast mitigation. Certain applications may require the film be used in conjunction with a film attachment system. The film shall be called **3M Ultra S400 Safety and Security Window Film**.

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 Z97.1 Specification for Safety Glazing Material used in Buildings

The American Society for Testing and Materials (ASTM):

- 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-882 Standard Test Method for Tensile Properties of Thin Plastic Sheeting
- ASTM D-1044 Standard Method of Test for Resistance of Transparent Plastics to Surface Abrasion (Taber Abrader Test)
- ASTM D-2582 Standard Test Method for Puncture-Propagation Tear Resistance of Plastic Film and Thin Sheeting
- ASTM D-4830 Standard Test Methods for Characterizing Thermoplastic Fabrics Used in Roofing and Waterproofing.
- ASTM G-90 Standard Practice for Performing Accelerated Outdoor Weatherizing for Non-metallic Materials Using Concentrated Natural Sunlight
- ASTM G 26 Standard Practice for Performing Accelerated Outdoor Weatherizing 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 E-1886 Standard Test Method for Performance of Exterior Windows, Curtain Walls, Doors, and Impact Protective Systems Impacted by Missile(s) and Exposed to Cyclic Pressure Differentials
- ASTM E-1996 Standard Specification for Performance of Exterior Windows, Curtain Walls, Doors and Impact Protective Systems Impacted by Windborne Debris in Hurricanes
- ASTM F-1642 Standard Method of Test for Glazing and Glazing Systems Subject to Airblast Loadings, as adapted by the U.S. Government GSA Test Standard Protocols
- ASTM F-2912 Standard Specification for Glazing and Glazing Systems Subjected to Airblast Loadings

The Consumer Products Safety Commission (CPSC) 16 CFR, Part 1201, Safety Standard for Architectural Glazing Material

GSA-TS01-2003 General Services Administration Standard Test for Glazing and Glazing Systems Subject to Airblast Loadings

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

3.0 Requirements of the Film

3.1 Film Material: The film material shall consist of an optically clear polyester film, consisting of 28 co-extruded microlayers, with a durable acrylic abrasion resistant coating over one surface, and a UV stabilized pressure sensitive adhesive on the other. The film color is clear and will not contain dyed polyester. The film shall have a nominal thickness of 4 mils (0.004 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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Specifications

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3.2 Film Properties (nominal):

- a) Tensile Strength (ASTM D882): 30,000 psi (60 lbs per inch width)
- b) Break Strength (ASTM D882): 30,000 psi (120 lbs per inch width)
- c) Percent Elongation at Break (ASTM D882): 125%
- d) Percent Elongation at Yield (ASTM D882): greater than 100%
- e) Yield Strength at 3% Elongation: 12,000 psi (24 lbs per inch width)
- f) Graves Tear Resistance (ASTM D1004, maximum force): 13 lbs
- g) Graves Area Tear Resistance (ASTM D1004): 780 lbs%
- h) Puncture Propagation Tear Resistance (ASTM D2582): 7.5 lbf
- i) Young's Modulus (ASTM D882): 500 kpsi

3.3 Solar Performance Properties: film applied to ¼" thick clear glass

- a) Visible Light Transmission: 86%
- b) Visible Reflection: not more than 11%
- c) Ultraviolet Transmission: less than 1% (300 – 380 nm)
- d) Solar Heat Gain Coefficient: 0.79

3.4 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

3.5 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.

3.6 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. 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.

3.7 Impact Resistance for Safety Glazing: The film, when applied to either side of the window glass, shall pass a 400 ft-lb impact when tested according to 16 CFR CPSC Part 1201 (Category 2) and ANSI Z97.1 (Class A, Unlimited) and shall pass the accelerated weathering test requirements for both tensile strength and peel strength.

3.8 Windborne Debris Protection: per ASTMs E1886 / E1996

- a. Film shall pass impact of Medium Large Missile "C" and withstand subsequent pressure cycling (per ASTMs E 1996 and E 1886) at 70 psf Design pressure with use of 3M Impact Protection Adhesive attachment system.
- b. Film shall pass impact of Small Missile "A" and withstand subsequent pressure cycling (per ASTMs E 1996 and E 1886) at 50 psf Design Pressure with use of 3M Impact Protection Adhesive attachment system.

3.9 Bomb Blast Mitigation:

- a. GSA Rating of "3B" (Low Hazard) with minimum blast pressure of 4 psi and 28 psi*msec blast impulse
- b. ASTM F1642 rating of "Low Hazard" with minimum blast pressure of 4 psi and 28 psi*msec blast impulse

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.

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