3M™ Scotchshield™ Safety & Security Window Film

Ultra S600

Technical Data

Product Features & Benefits

- Micro-layered film designed for tear resistance
- Optically clear
- Applies to interior glass surfaces
- Helps protect from broken glass hazards
- Helps extend the life of furnishings by significantly reducing harmful UV rays

Applications

- Bomb Blast Mitigation
- Safety Glazing
- Helping to Deter Break & Entry
- Building Envelope Protection
- Spontaneous Glass Breakage
- Seismic Preparedness

Performance Testing*

Method	Glass Substrate	Film Attachment	Rating	
Safety Glazing				
16 CFR 1201	¼" & 1/8" annealed	--	Category 2, 400 ft-lbs	
ANSI Z97.1			Class A (Unlimited), 400 ft-lbs	
Impact Resistance				
ASTMs E1886 / E1996	3/16" tempered	IPA	Missile Level A, +/- 80 psf	
ASTM E330			+/- 100 psf	
Blast Mitigation			**Blast Load**	**Rating**
GSA TS01-2003 / ASTM F1642	¼" annealed	IPA	6 psi, 42 psi*msec	GSA Level 2 / ASTM "Minimal Hazard"
		IPP	6 psi, 42 psi*msec	GSA Level 2 / ASTM "Minimal Hazard"
	¼" tempered	IPA	6 psi, 42 psi*msec	GSA Level 2 / ASTM "No Hazard"
		IPP	6 psi, 42 psi*msec	GSA Level 2 / ASTM "Minimal Hazard"
	1" double pane (annealed)	IPA	9 psi, 60 psi*msec	GSA Level 2 / ASTM "Minimal Hazard"
		IPP	8 psi, 60 psi*msec	GSA Level 2 / ASTM "Minimal Hazard"

*** Glazing systems vary. Contact 3M for more information.**

Film Properties (nominal)

Film Thickness	6 mils
Film Construction	Micro-layered
Tensile Properties (ASTM D882)	
Tensile Strength	32,000 psi
Break Strength	210 lbs/in
Elongation at Break	115%
Yield Strength	15,000 psi
Elongation at Yield	9%
Modulus	443 kpsi

Graves Area Tear Resistance (ASTM D1004)	1,000 lbs%
Puncture-Propagation-Tear Resistance (ASTM D2582)	6 lbf
Puncture Strength (ASTM D4830)	140 lbf
Abrasion Resistance (ASTM D1044)	3% ' haze
Peel Strength (ASTM D3330)	8 lb/in
Flammability (ASTM E84)	Class A
Solar Properties – *film applied to ¼" clear glass*	
Visible Light Transmitted	87%
UV Light Rejected	99.9%

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3M
Renewable Energy Division
St. Paul, MN 55144-1000
1-866-499-8857

Specifications

Specifications for 3M™ Scotchshield™ Safety and Security Window Film, Ultra S600

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 designed to provide an increased measure of protection in a broad range of uses including basic glass fragment retention, spontaneous glass breakage, seismic preparedness, safety glazing, bomb blast mitigation, Smash and Grab or Break and Entry events. Certain applications may require the film be used in conjunction with a film attachment system. The film shall be called **3M™ Scotchshield™ Safety and Security Window Film, Ultra S600**.

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. 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 co-extruded micro-layers, 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 6 mils (0.006 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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3.2 **Film Properties (nominal)**:

a) Tensile Strength (ASTM D882):
Base Film: 32,000 psi (MD) / 32,000 psi (TD)
Coated Film: 32,000 psi (MD) / 32,000 psi (TD)

b) Break Strength (ASTM D882):
Base Film: 190 lb/in (MD) / 190 lb/in (TD)
Coated Film: 210 lb/in (MD) / 210 lb/in (TD)

c) Percent Elongation at Break (ASTM D882):
Base Film: 110 % (MD) / 100% (TD)
Coated Film: 137 % (MD) / 115% (TD)

d) Yield Strength at 3% Elongation:
Base Film: 12,000 psi (MD)
Coated Film: 15,000 psi (MD)

e) Percent Elongation at Yield (ASTM D882):
Base Film: 7% (MD)
Coated Film: 9% (MD)

f) Modulus (ASTM D882):
Base Film: 550 kpsi (MD) / 600 kpsi (TD)
Coated Film: 430 kpsi (MD) / 456 kpsi (TD)

g) Graves Tear Resistance (ASTM D1004):
Maximum Force (lbs):
Base Film: 28 (MD) / 28 (TD)
Coated Film: 28 (MD) / 28 (TD)
Maximum Extension (in):
Base Film: 0.45 (MD) / 0.65 (TD)
Coated Film: 0.55 (MD) / 0.55 (TD)
Graves Area Tear Resistance (lbs%):
Base Film: 900 (MD) / 1,200 (TD)
Coated Film: 900 (MD) / 1,100 (TD)

h) Puncture Propagation Tear Resistance (ASTM D2582):
Coated Film: 6 lbf (MD) / 7 lbf (TD)

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

a) Visible Light Transmission: 88%
b) Visible Reflection: not more than 9%
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.

a) Flame Spread Index (FDI): 0
b) Smoke Developed Index (SDI): 15

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 Calibrase Wheel.

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3.6 **Adhesion to Glass**: The Manufacturer shall provide independent test data showing that the film shall have a 180-degree peel strength (adhesion to glass) according to ASTM D-1044 of at least 8 lbs/in.

3.7 **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 pressure sensitive (not water activated) and physically bond (not chemically bond) to the glass. 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.

3.8 **Impact Resistance for Safety Glazing**: The Manufacturer shall provide independent test data showing that the film, when applied to either side of the window glass, shall meet the 400 ft-lb impact requirements of 16 CFR 1201 (Category 2) and ANSI Z97.1 (Class A, Unlimited). Testing shall be done with film applied both on 1/8" and ¼" annealed glass.

3.9 **Impact Protection:** The Manufacturer shall provide independent test data showing the following:

a. [reserved]
b. Film shall pass impact of Small Missile "A" and withstand subsequent pressure cycling (per ASTMs E1996 and E1886) at +/- 80 psf Design Pressure with use of 3M Impact Protection Adhesive attachment system.
c. Film shall pass ASTM E330 at a design pressure of 150 psf with 3M Impact Protection Adhesive attachment system

3.10 **Bomb Blast Mitigation:** The Manufacturer shall provide independent test data showing the following:

a. GSA Rating of "2" (Minimal Hazard) / ASTM F1642 "Minimal Hazard" with blast pressure of 7 psi and 44 psi*msec blast impulse, on ¼" annealed single pane glass and 3M Impact Protection Profile Attachment system
b. GSA Rating of "2" (Minimal Hazard) / ASTM F1642 "Minimal Hazard" with blast pressure of 7 psi and 42 psi*msec blast impulse, on ¼" tempered single pane glass and 3M Impact Protection Profile Attachment system
c. GSA Rating of "2" (Minimal Hazard) / ASTM F1642 "Minimal Hazard" with blast pressure of 7 psi and 42 psi*msec blast impulse, on ¼" annealed single pane glass and 3M Impact Protection Adhesive Attachment system
d. GSA Rating of "2" (Minimal Hazard) / ASTM F1642 "Minimal Hazard" with blast pressure of 7 psi and 42 psi*msec blast impulse, on ¼" tempered single pane glass and 3M Impact Protection Adhesive Attachment system
e. GSA Rating of "2" (Minimal Hazard) / ASTM F1642 "Minimal Hazard" with blast pressure of 8 psi and 60 psi*msec blast impulse, on 1" annealed double pane glass and 3M Impact Protection Profile Attachment system
f. GSA Rating of "2" (Minimal Hazard) / ASTM F1642 "Minimal Hazard" with blast pressure of 8 psi and 60 psi*msec blast impulse, on 1" annealed double pane glass and 3M Impact Protection Adhesive Attachment system

4.0 Requirements of the Authorized Dealer/Applicator (ADA)

4.1 The ADA shall provide documentation that the ADA is authorized 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

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5.0 Requirements of the Manufacturer

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

5.2 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.

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 scraped with stainless steel razor blades with clean, sharp edges to ensure the removal of any foreign contaminants without damages the glass surface.
b. Drop cloths 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. Film shall be wet-applied using clean water and slip solution to facilitate positioning of the film onto glass.
d. To ensure efficient removal of excess water from the underside of the film and to maximize bonding of the pressure sensitive adhesive, polyplastic bladed squeegees shall be used.
e. Upon completion, the film may 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 leftover 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

a) The application shall be warranted by the film manufacturer (3M) for a period of _____ 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.

b) 8.2 The film manufacturer (3M) also warrants against glass failure due to thermal shock fracture of the glass 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 must be reviewed by the film manufacturer (3M) prior to replacement.

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