

SECTION 08 87 00

WINDOW FILM

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\*\* NOTE TO SPECIFIER \*\* 3M Commercial Solutions; sun control window films, safety and security window films, architectural window films.
This section is based on the products of 3M Commercial Solutions, which is located at:
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[[Click Here](http://www.arcat.com/arcatcos/cos47/arc47922.html)] for additional information.

As an industry leader in both adhesive and film manufacturing, 3M combines these technologies to provide state of the art Safety and Security Window Films to residential, commercial, and government sectors.
3M Safety and Security Window Films help provide an added measure of protection for a variety of purposes including safety glazing applications, blast mitigation, building envelope protection, to help deter forced entry, and fragment retention for spontaneous glass breakage and seismic events.
3M Safety and Security Films provide up to 99 percent protection against the sun's destructive ultraviolet rays, helping to protect valuable furnishings from fading.
3M Safety and Security Films are also available with sun control properties to help reduce glare, improve comfort, add privacy, and save on energy costs. 3M Safety and Security Window Films provide a practical, cost effective solution to help protect people, property, and provide continuity of operations that would otherwise be at a higher risk with conventional glass.

1. GENERAL
	1. SECTION INCLUDES
		1. Safety and Security Window Film:
			1. Microlayered and sun control film. (Ultra Prestige S70) (Ultra Prestige S50) (Ultra Night Vision S25)
	2. RELATED SECTIONS

\*\* NOTE TO SPECIFIER \*\* Delete any sections below not relevant to this project; add others as required.

* + 1. Section 08 54 13 - Fiberglass Windows.
		2. Section 08 60 00 - Roof Windows and Skylights.
		3. Section 08 83 13 - Mirrored Glass Glazing.
		4. Section 08 44 23 - Structural Sealant Glazed Curtain Wall.
	1. REFERENCES
		1. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test.
		2. ASHRAE - American Society for Heating, Refrigeration, and Air Conditioning Engineers; Handbook of Fundamentals.
		3. ASTM International (ASTM):
			1. ASTM D 1004 - Standard Test Method for Tear Resistance (Graves Tear) of Plastic Film and Sheeting.
			2. ASTM D 1044 - Standard Method of Test for Resistance of Transparent Plastics to Surface Abrasion (Taber Abrader Test).
			3. ASTM D 2582 - Standard Test Method for Puncture-Propagation Tear Resistance of Plastic Film and Thin Sheeting.
			4. ASTM E 84 - Standard Method of Test for Surface Burning Characteristics of Building Materials.
			5. ASTM E 903 - Standard Methods of Test for Solar Absorbance, Reflectance and Transmittance of Materials Using Integrating Spheres.
			6. 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.
			7. ASTM E 1996 - Standard Specification for Performance of Exterior Windows, Curtain Walls, Doors and Impact Protective Systems Impacted by Windborne Debris in Hurricanes.
			8. ASTM F 1642 - Standard Method of Test for Glazing and Glazing Systems Subject to Airblast Loadings
			9. ASTM F 2912 - Standard Specification for Glazing and Glazing Systems Subject to Airblast Loadings.
		4. Consumer Products Safety Commission 16 CFR, Part 1201 - Safety Standard for Architectural Glazing Materials.
		5. GSA-TS01 - Standard Test for Glazing and Glazing Systems Subject to Airblast Loadings.
		6. NFRC 100/200 (Formerly ASTM E903) - Standard Methods of Test for Solar Absorbance, Reflectance and Transmittance of Materials Using Integrating Spheres.
		7. ISO 16933, International Standard for Glass in Building: Explosion-resistant security glazing - Test and classification for arena air-blast testing.
	2. PERFORMANCE REQUIREMENTS
		1. Blast Hazard Mitigation Performance:
			1. GSA Rating of "2" / ASTM F1642 "No Hazard" with minimum blast load of 9 psi and 60 psi\*msec, on 1 inch (25 mm) double pane glass and film attachment system.
		2. Impact Resistance and Pressure Cycling:
			1. ASTM E1996 / E1886: Small Missile "A", +/- 70 psf Design Pressure
		3. Tear Resistance:

\*\* NOTE TO SPECIFIER \*\* Tear resistance is an important property for most safety and security window film applications, as it relates to the film's ability to absorb energy prior to failure. Manufacturer shall submit tear resistance data meeting the full testing and reporting requirements of ASTM D1004. Data shall be submitted for BOTH film orientations so as to indicate balance for tear resistant properties. The following tear resistance values shall be reported, per the requirements of ASTM D1004: peak load or maximum force (lbf, or N); the maximum extension (in, or mm); and the Total Graves Area Tear resistance (lbs%, or N%), which represents total energy absorbed.

\*\* NOTE TO SPECIFIER \*\* The following paragraphs apply to Microlayered Safety and Security Window Films with Sun Control: Ultra Prestige S70, Ultra Prestige S50, and Ultra Night Vision S25. Delete if not required.

* + - 1. Minimum Graves Area Tear Strength of 1,100 lbs% as measured on coated film product, without liner, per ASTM D1004
		1. Adhesion to Glass:

\*\* NOTE TO SPECIFIER \*\* Adhesive properties relate to the film's ability to retain broken glass fragments - critical for wide range of safety film applications. Verify the peel strength of the film through submittal of 3rd Party Test reports.

\*\* NOTE TO SPECIFIER \*\* The following paragraphs apply to Microlayered Safety and Security Window Films with Sun Control: Ultra Prestige S70. Ultra Prestige S50, and Ultra Night Vision S25. Delete if not required.

* + - 1. Minimum 6 lbs/in peel strength per ASTM D3330 (Method A).
		1. Flammability: Surface burning characteristics when tested in accordance ASTM E 84, demonstrating film applied to glass rated Class A for Interior Use:

\*\* NOTE TO SPECIFIER \*\* Flammability properties are important to ensure the film is properly rated for interior use. Class A rated for Interior Use requires a Flame Spread Index no greater than 25; and Smoke Developed Index no greater than 450. Verify Flammability properties through submittal of 3rd Party Test reports.

* + - 1. Flame Spread Index: no greater than 25.
			2. Smoke Developed Index: no greater than 55.
		1. Abrasion Resistance:

\*\* NOTE TO SPECIFIER \*\* Abrasion Resistance relates to the durability and scratch resistance of the film. Verify Abrasion Resistance through 3rd Party testing, per ASTM D1044.

\*\* NOTE TO SPECIFIER \*\* The following paragraphs apply to Microlayered Safety and Security Window Films with Sun Control: 3M Ultra Prestige S70, Ultra Prestige S50, and Ultra Night Vision S25. Delete if not required.

* + - 1. Film shall have a surface coating that is resistant to abrasion such that less than 3 percent increase of transmitted light haze will result when tested in accordance to ASTM D 1044 using 100 cycles, 500 grams weight, and the CS10F Calibrase Wheel.
		1. UV Light Rejection:

\*\* NOTE TO SPECIFIER \*\* UV Light Rejection relates to the durability of films, especially those applied to exterior windows and glass. Review Manufacturer's technical information on amount of UV Light Rejection.

\*\* NOTE TO SPECIFIER \*\* The following paragraphs apply to Microlayered Safety and Security Window Films with Sun Control: 3M Ultra Prestige S70, Ultra Prestige S50, and Ultra Night Vision S25. Delete if not required.

* + - 1. Minimum of 99.9% UV light rejection (300 - 380 nm), per ASTM E903, as determined with film applied on 1/4 inch clear glass.
	1. SUBMITTALS
		1. Submit under provisions of Section 01 30 00.
		2. Product Data: Manufacturer's current technical literature on each product to be used, including:
			1. Manufacturer's Data Sheets.
			2. Preparation instructions and recommendations.
			3. Storage and handling requirements and recommendations.
			4. Installation methods.

\*\* NOTE TO SPECIFIER \*\* DELETE if safety and security films are not required. DELETE Test Report submittal requirement when proprietary specification is used and can be held. MAINTAIN Test Report submittal requirement when other products may be submitted for substitution.

* + 1. 3rd Party Test Report Submittal Requirements. Submit the following 3rd Party test reports indicating compliance with the test values listed in this section.

\*\* NOTE TO SPECIFIER \*\* The following paragraphs apply to Clear Microlayered Safety and Security Window Films, Ultra S600 and Ultra S800; and Microlayered Films with Sun Control: Ultra Prestige S70, Ultra Prestige S50, and Ultra Night Vision S25. Delete if not required.

* + - 1. Flammability Testing, ASTM E84.
			2. Film Properties Testing, ASTM D882.
			3. Abrasion Resistance Testing, ASTM D1044.
			4. Peel Strength Testing, ASTM D3330.
			5. Tear Resistance Testing, ASTM D1004.
			6. Puncture Strength Testing, ASTM D4830.
			7. Safety Glazing Impact Testing, ANSI Z97.1 and/or 16 CFR 1201.

\*\* NOTE TO SPECIFIER \*\* Delete if not required.

* + 1. Verification Samples: For each film specified, two samples representing actual film color and pattern.
		2. Performance Submittals: Provide laboratory data of emissivity and calculated window U-Factors for various outdoor temperatures based upon established calculation procedure defined by the ASHRAE Handbook of Fundamentals, Chapter 29, or Lawrence Berkeley Laboratory Window 5.2 Computer Program.
	1. QUALITY ASSURANCE
		1. Manufacturer Qualifications: All primary products specified in this section will be supplied by a single manufacturer with a minimum of ten years experience.

\*\* NOTE TO SPECIFIER \*\*Pressure Sensitive Adhesives (PSA) physically bond to the glass, allowing for the film to be removed at the end of life. Clear Dry Adhesives (CDA) chemically bond to the glass. These may require the use of toxic chemicals to remove, or the complete replacement of the existing glass, significantly increasing end of life costs.

* + - 1. Provide documentation that the adhesive used on the specified films is a Pressure Sensitive Adhesive (PSA).
		1. Installer Qualifications: All products listed in this section are to be installed by a single installer with a minimum of five years demonstrated experience in installing products of the same type and scope as specified.
			1. Provide documentation that the installer is authorized by the Manufacturer to perform Work specified in this section.
			2. Provide a commercial building reference list of 5 properties where the installer has applied window film. This list will include the following information:
				1. Name of building.
				2. The name and telephone number of a management contact.
				3. Type of glass.
				4. Type of film and/or film attachment system.
				5. Amount of film and/or film attachment system installed.
				6. Date of completion.
			3. Provide a Glass Stress Analysis of the existing glass and proposed glass/film combination as recommended by the film manufacturer.

\*\* NOTE TO SPECIFIER \*\* Include a mock-up if the project size and/or quality warrant taking such a precaution. The following is one example of how a mock-up on a large project might be specified. When deciding on the extent of the mock-up, consider all the major different types of work on the project.

* + 1. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
			1. Finish areas designated by Architect.
			2. Do not proceed with remaining work until workmanship, color, and sheen are approved by Architect.
			3. Refinish mock-up area as required to produce acceptable work.
	1. DELIVERY, STORAGE, AND HANDLING
		1. Follow Manufacturer's instructions for storage and handling.
		2. Store products in manufacturer's unopened packaging until ready for installation.
		3. Store and dispose of hazardous materials, and materials contaminated by hazardous materials, in accordance with requirements of local authorities having jurisdiction.
	2. PROJECT CONDITIONS
		1. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's recommended limits.
	3. WARRANTY
		1. At project closeout, provide to Owner or Owners Representative an executed current copy of the manufacturer's standard limited warranty against manufacturing defect, outlining its terms, conditions, and exclusions from coverage.
		2. In order to validate warranty, installation must be performed by an Authorized 3M dealer and according to Manufacturer's installation instructions. Verification of Authorized 3M dealer can be confirmed by submission of active 3M dealer code number.
1. PRODUCTS
	1. MANUFACTURERS
		1. Acceptable Manufacturer: 3M Commercial Solutions, which is located at: 3M Center Bldg. 220-12-E-04; St. Paul, MN 55144-1000; Toll Free Tel: 888-650-3497; Tel: 651-737-1081; Fax: 651 737 8241; Email:[request info (vkampmeyer@mmm.com)](http://admin.arcat.com/users.pl?action=UserEmail&company=3M+Commercial+Solutions&coid=47922&rep=&fax=651); Web:[http://www.3m.com/3M/en\_US/architectural-design-us/?utm\_medium=redirect&utm\_source=vanity-url&utm\_campaign=www.3M.com/AMD](http://http://www.3m.com/3M/en_US/architectural-design-us/?utm_medium=redirect&utm_source=vanity-url&utm_campaign=www.3M.com/AMD)|[http://www.3m.com/3M/en\_US/building-window-solutions-us](http://http://www.3m.com/3M/en_US/building-window-solutions-us)
		2. Substitutions: Not permitted.
	2. MICROLAYERED SAFETY AND SECURITY WINDOW FILM WITH SUN CONTROL
		1. 3M Scotchshield Ultra Night Vision S25: Optically clear polyester film comprised of co-extruded micro-layers, laminated to a metalized polyester film. Additional film layer is added for color and performance, with a durable abrasion resistant coating over one surface and a pressure sensitive adhesive on the other. The adhesive is pressure-activated, not water-activated, and forms a physical bond, not chemical bond, to the glass. The film color is derived from the metal coating and the product will not contain dyed polyester.
			1. Physical / Mechanical Performance Properties:
				1. Film Color: Moderately tinted.
				2. Thickness: Nominal 8.0 mils
				3. Tensile Strength (ASTM D 882): 28,000 psi (MD) / 27,000 psi (TD)
				4. Break Strength (ASTM D 882): 235 lbs/in (MD) / 230 lbs/in (TD)
				5. Percent Elongation at Break (ASTM D882): 120% (MD) / 85% (TD)
				6. Yield Strength (ASTM D882): 17,000 psi (MD)
				7. Percent Elongation at Yield (ASTM D882): 8% (MD)
				8. Graves Tear Resistance (ASTM D1004):

Maximum Force: 37 lbs (MD) / 38 lbs (TD)

Maximum Strain: 49% (MD) / 46% (TD)

Graves Area Tear Resistance: 1,100 lbs% (MD) / 900 lbs% TD)

* + - * 1. Puncture Propagation Tear (ASTM D 2582): 10 lbf
			1. Solar Performance Properties: Film applied to 1/4 Inch thick clear glass.
				1. Visible Light Transmission (ASTM E 903): 24 percent.
				2. Visible Reflection (ASTM E 903): Not more than 20 percent exterior / 7% interior.
				3. Ultraviolet Transmission (ASTM E 903): Less than 0.5 percent.
				4. Solar Heat Gain Coefficient (ASTM E 903): 0.40
				5. Total Solar Energy Rejected: 60%
			2. Uniformity: No noticeable pin holes, streaks, thin spots, scratches, banding or other optical defects.
			3. Variation in Total Transmission across the Width: Less than 2 percent over the average at any portion along the length.
			4. Identification: Labeled as to Manufacturer as listed in this Section.
1. EXECUTION
	1. EXAMINATION
		1. Film Examination:
			1. If preparation of glass surfaces is the responsibility of another installer, notify Architect in writing of deviations from manufacturer's recommended installation tolerances and conditions.
				1. Glass surfaces receiving new film should first be examined to verify that they are free from defects and imperfections, which will affect the final appearance.
			2. Do not proceed with installation until glass surfaces have been properly prepared and deviations from manufacturer's recommended tolerances are corrected. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result under the project conditions.
			3. Commencement of installation constitutes acceptance of conditions.
	2. PREPARATION
		1. Clean surfaces thoroughly prior to installation.
		2. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
		3. Refer to Manufacturer's installation instructions for methods of preparation for Impact Protection Adhesive or Impact Protection Profile film attachment systems.
	3. INSTALLATION
		1. Film Installation, General:
			1. Install in accordance with manufacturer's instructions.
			2. Cut film edges neatly and square at a uniform distance of 1/8 inch (3 mm) to 1/16 inch (1.5 mm) of window sealant. Use new blade tips after 3 to 4 cuts.
			3. Spray the slip solution, composed of one capful of baby shampoo or dishwashing liquid to 1 gallon of water, on window glass and adhesive to facilitate proper positioning of film.
			4. Apply film to glass and lightly spray film with slip solution.
			5. Squeegee from top to bottom of window. Spray slip solution to film and squeegee a second time.
			6. Bump film edge with lint-free towel wrapped around edge of a 5-way tool.
			7. Upon completion of film application, allow 30 days for moisture from film installation to dry thoroughly, and to allow film to dry flat with no moisture dimples when viewed under normal viewing conditions.
			8. If completing an exterior application, check with the manufacturer as to whether edge sealing is required.
	4. CLEANING AND PROTECTION
		1. Remove left over material and debris from Work area. Use necessary means to protect film before, during, and after installation.
		2. Touch-up, repair or replace damaged products before Substantial Completion.
		3. After application of film, wash film using common window cleaning solutions, including ammonia solutions, 30 days after application. Do not use abrasive type cleaning agents and bristle brushes to avoid scratching film. Use synthetic sponges or soft cloths.

END OF SECTION