SECTION 08 87 13

SUN CONTROL 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:3M Center, Bldg. 223St. Paul, MN 55144-1000Toll Free Tel: 888-650-3497Tel: 651-737-1081Fax: 651-737-8241Email: [request info (apeters2@mmm.com)](https://arcat.com/rfi?action=email&company=3M%252BCommercial%252BSolutions&message=RE%253A%2520Spec%2520Question%2520(08871mmm)%253A%2520&coid=47922&spec=08871mmm&rep=&fax=651-737-8241)
Web: [http://www.3m.com/3M/en\_US/architectural-design-us/?utm\_medium=redirect&amp;utm\_source=vanity-url&amp;utm\_campaign=www.3M.com/AMD](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>
 [ [Click Here](https://arcat.com/company/3m-commercial-solutions-47922) ] 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% 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.
3M Impact Protection Systems enable a total systems solution with safety and security film. By anchoring the film to the frame, they help keep the broken glass secured in the window opening which helps provide and increased level of safety and security for helping to deter smash and grab, blast hazard mitigation, building envelope protection, seismic preparedness, and when film is applied to tempered glass.
3M Anti-Graffiti films help protect the glass surface against the most common methods of vandalism, such as glass etchants, gauging, abrasion, while reducing the ultraviolet light that normally would enter through the window by up to 99%. They have a durable abrasion resistant hardcoat on the outer surface and an adhesive that is designed to not leave residue on the glass when replacement of the film is needed due to vandalism.

1. GENERAL
	1. SECTION INCLUDES

\*\* NOTE TO SPECIFIER \*\* Delete items below not required for project.

* + 1. Sun control window films of the following types:
			1. Prestige sun control film.
			2. Ceramic sun control film.
			3. Night vision sun control film.
			4. Traditional series sun control film.
			5. Exterior series sun control film.
			6. All Season sun control film.
	1. RELATED SECTIONS

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

* + 1. Section 08 50 00 - 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

\*\* NOTE TO SPECIFIER \*\* Delete references from the list below that are not actually required by the text of the edited section.

* + 1. ASHRAE - American Society for Heating, Refrigeration, and Air Conditioning Engineers; Handbook of Fundamentals.
		2. ASTM International (ASTM):
			1. ASTM D 882 - Standard Test Method for Tensile Properties of Thin Plastic Sheeting.
			2. ASTM D 412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers -- Tension.
			3. ASTM D 624 - Standard Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomers.
			4. ASTM D 1004 - Standard Test Method for Tear Resistance (Graves Tear) of Plastic Film and Sheeting.
			5. ASTM D 1044 - Standard Method of Test for Resistance of Transparent Plastics to Surface Abrasion (Taber Abrader Test).
			6. ASTM D 2240 - Standard Method for Rubber Property - Durometer Hardness.
			7. ASTM D 2582 - Standard Test Method for Puncture-Propagation Tear Resistance of Plastic Film and Thin Sheeting.
			8. ASTM D 5895 - Standard Test Methods for Evaluating Drying or Curing During Film Formation of Organic Coatings Using Mechanical Recorders.
			9. ASTM D 4830 - Standard Test Methods for Characterizing Thermoplastic Fabrics Used in Roofing and Waterproofing.
			10. ASTM E 84 - Standard Method of Test for Surface Burning Characteristics of Building Materials.
			11. ASTM E 308 - Standard Recommended Practice for Spectrophotometry and Description of Color in CIE 1931 System.
			12. ASTM E 903 - Standard Methods of Test for Solar Absorbance, Reflectance and Transmittance of Materials Using Integrating Spheres.
			13. 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.
			14. ASTM E 1996 - Standard Specification for Performance of Exterior Windows, Curtain Walls, Doors and Impact Protective Systems Impacted by Windborne Debris in Hurricanes.
			15. ASTM F1642 - Standard Method of Test for Glazing and Glazing Systems Subject to Airblast Loadings.
			16. ASTM F2912 - Standard Specification for Glazing and Glazing Systems Subject to Airblast Loadings.
			17. NFRC 100/200 (Formerly ASTM E903) - Standard Methods of Test for Solar Absorbance, Reflectance and Transmittance of Materials Using Integrating Spheres.
		3. Window 6.3 - A Computer Tool for Analyzing Window Thermal Performance; Lawrence Berkeley Laboratory.
		4. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test.
		5. IES LM-83-12: IES Spatial Daylight Autonomy (sDA) and Annual Sunlight Exposure.
		6. Consumer Products Safety Commission 16 CFR, Part 1201 - Safety Standard for Architectural Glazing Materials.
		7. GSA-TS01 - Standard Test for Glazing and Glazing Systems Subject to Airblast Loadings.
		8. ISO 16933, International Standard for Glass in Building: Explosion-resistant security glazing - Test and classification for arena air-blast testing.
		9. Underwriters Laboratories Inc. (UL): UL 972 - Burglary Resisting Glazing Material.
	1. DEFINITIONS
		1. Light to Solar Gain Ratio: The ratio of visible light transmission to Solar Heat Gain Coefficient.
	2. PERFORMANCE REQUIREMENTS
		1. Fire Performance: Surface burning characteristics when tested in accordance ASTM E 84:
			1. Flame Spread: 25, maximum.
			2. Smoke Developed: 450, maximum.

\*\* NOTE TO SPECIFIER \*\*Application to All Seasons series only. Delete if not required.

* + 1. Abrasion Resistance: Film must have a surface coating that is resistant to abrasion such that, less than 5 percent increase of transmitted light haze will result in accordance with ASTM D 1044 using 50 cycles, 500 grams weight, and the CS10F Calbrase Wheel.
	1. SUBMITTALS
		1. Submit under provisions of Section 01 30 00 - Administrative Requirements.
		2. Product Data: Manufacturer's data sheets on each product to be used, including:
			1. Preparation instructions and recommendations.
			2. Storage and handling requirements and recommendations.
			3. Installation methods.

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

* + 1. Verification Samples: For each finish product specified, two samples representing actual product, color, and patterns.
		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 (10) 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 (5) 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.

\*\* NOTE TO SPECIFIER \*\* Delete the next paragraph if a Glass Stress Analysis is not required.

* + - 1. Provide a Glass Stress Analysis of the existing glass and proposed glass/film combination as recommended by the film Manufacturer.

\*\* NOTE TO SPECIFIER \*\* Delete the next paragraph if an Energy Savings Calculation is not required.

* + - 1. Provide an EFilm application analysis to determine available energy cost reduction and savings.

\*\* NOTE TO SPECIFIER \*\* Delete the next paragraph if you are not specifying 3M Daylight Redirecting Film.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 storing and handling.
		2. Store products in manufacturer's unopened packaging until ready for installation.
	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 absolute 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. 223St. Paul, MN 55144-1000Toll Free Tel: 888-650-3497Tel: 651-737-1081Fax: 651-737-8241Email: [request info (apeters2@mmm.com)](https://arcat.com/rfi?action=email&company=3M%252BCommercial%252BSolutions&message=RE%253A%2520Spec%2520Question%2520(08871mmm)%253A%2520&coid=47922&spec=08871mmm&rep=&fax=651-737-8241);Web: [http://www.3m.com/3M/en\_US/architectural-design-us/?utm\_medium=redirect&amp;utm\_source=vanity-url&amp;utm\_campaign=www.3M.com/AMD](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>
		2. Substitutions: Not permitted.

\*\* NOTE TO SPECIFIER \*\* 3M Prestige Window Films, provides the benefits of a world-class window film while leaving the beauty of your windows virtually unchanged. Because 3M Prestige Window Films use no metals, they are not susceptible to corrosion including coastal environments and do not interfere with mobile phone reception. Other window films that reject heat tend to have high reflectivity, but not Prestige. 3M Prestige Window Films offer reflectivity that is actually lower than glass. A final key technical feature of the Prestige line of products is that they were designed to perform best when the sun is high, at the hottest parts of the day so, when the sun is working hardest, 3M Films are performing their best. Delete if not required.

* 1. 3M PRESTIGE SUN CONTROL FILM
		1. Physical Properties:
			1. Composition: Optically clear polyester film containing at least 220 layers and incorporating pressure sensitive adhesive on one side and an acrylic abrasion resistant coating on the other. Nanotechnology represents a breakthrough in technology due to the enhanced heat, UV and IR rejection, without the presence of any metals.The film does not contain dyes.
			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. Thickness: Nominal 2.0 mils (0.1 mm) with no evidence of coating voids.
			5. Identification: Labeled as to Manufacturer as listed in this Section.
		2. Performance, Prestige 70 - Clear Film, nanotechnology, no metal and at least 220 plus layers applied to 1/4 Inch (6.4 mm) Thick Clear Glass:
			1. Visible Light Transmission (NFRC 100/200, ASTM E 308): 69 percent.
			2. Visible Reflection - Exterior (NFRC 100/200): 9 percent.
			3. Visible Reflection - Interior (NFRC 100/200): 9 percent.
			4. Ultraviolet Rejected (NFRC 100/200): 99.9 percent.
			5. Infrared Energy Rejected (NFRC 100/200): Up to 97 percent; as measured between 900-1000 nm.
			6. Light to Solar Gain Ratio: 1.4.
			7. Solar Heat Gain Coefficient (Normal Incidence) (NFRC 100/200): 0.50.
			8. Total Solar Energy Rejected (TSER) at 90 Degrees (Normal Incidence) (NFRC 100/200): 50 percent.
			9. Total Solar Energy Rejected (TSER) at 60 Degrees (NFRC 100/200): 59 percent.
		3. Performance, Prestige 60 - Clear Film, nanotechnology, no metal and at least 220 plus layers applied to 1/4 Inch (6.4 mm) Thick Clear Glass:
			1. Visible Light Transmission (ASTM E 84): 60 percent.
			2. Visible Reflection - Exterior (NFRC 100/200): 8 percent.
			3. Visible Reflection - Interior (NFRC 100/200): 8 percent.
			4. Ultraviolet Rejected (NFRC 100/200): 99.9 percent.
			5. Infrared Energy Rejected (NFRC 100/200): Up to 97 percent; as measured between 900-1000 nm.
			6. Light to Solar Gain Ratio: 1.3.
			7. Solar Heat Gain Coefficient at 90 Degrees (Normal Incidence) (NFRC 100/200): 0.47.
			8. Total Solar Energy Rejected (TSER) at 90 Degrees (Normal Incidence) (NFRC 100/200): 53 percent.
			9. Total Solar Energy Rejected (TSER) at 60 Degrees (NFRC 100/200): 61 percent.
		4. Performance, Prestige 50 - Lightly Tinted Film, nanotechnology, no metal and at least 220 plus layers applied to 1/4 Inch (6.4 mm) Thick Clear Glass:
			1. Visible Light Transmission (ASTM E 84): 50 percent.
			2. Visible Reflection - Exterior (NFRC 100/200): 8 percent.
			3. Visible Reflection - Interior (NFRC 100/200): 7 percent.
			4. Ultraviolet Rejected (NFRC 100/200): 99.9 percent.
			5. Infrared Energy Rejected (NFRC 100/200): 97 percent; as measured between 900-1000 nm.
			6. Light to Solar Gain Ratio: 1.1.
			7. Solar Heat Gain Coefficient at 90 Degrees (Normal Incidence) (NFRC 100/200): 0.44.
			8. Total Solar Energy Rejected (TSER) at 90 Degrees (Normal Incidence) (NFRC 100/200): 56 percent.
			9. Total Solar Energy Rejected (TSER) at 60 Degrees (NFRC 100/200): 63 percent.
		5. Performance, Prestige 40 - Lightly Tinted Film, nanotechnology, no metal and at least 220 plus layers applied to 1/4 Inch (6.4 mm) Thick Clear Glass:
			1. Visible Light Transmission (NFRC 100/200): 39 percent.
			2. Visible Reflection - Exterior (NFRC 100/200): 7 percent.
			3. Visible Reflection - Interior (NFRC 100/200): 7 percent.
			4. Ultraviolet Rejected (NFRC 100/200): 99.9 percent.
			5. Infrared Energy Rejected (NFRC 100/200): Up to 97 percent; as measured between 900-1000 nm.
			6. Light to Solar Gain Ratio: 1.0.
			7. Solar Heat Gain Coefficient at 90 Degrees (Normal Incidence) (NFRC 100/200): 0.40.
			8. Total Solar Energy Rejected (TSER) at 90 Degrees (Normal Incidence) (NFRC 100/200): 60 percent.
			9. Total Solar Energy Rejected (TSER) at 60 Degrees (NFRC 100/200): 66 percent.
		6. Performance, Prestige 20 - Lightly Tinted Film, nanotechnology, no metal and at least 220 plus layers applied to 1/4 Inch (6.4 mm) Thick Clear Glass:
			1. Visible Light Transmission (NFRC 100/200): 21 percent.
			2. Visible Reflection - Exterior (NFRC 100/200): 6 percent.
			3. Visible Reflection - Interior (NFRC 100/200): 5 percent.
			4. Ultraviolet Rejected (NFRC 100/200): 99.9 percent.
			5. Infrared Energy Rejected (NFRC 100/200): Up to 97 percent; as measured between 900-1000 nm.
			6. Light to Solar Gain Ratio: 0.6.
			7. Solar Heat Gain Coefficient at 90 Degrees (Normal Incidence) (NFRC 100/200): 0.38.
			8. Total Solar Energy Rejected (TSER) at 90 Degrees (Normal Incidence) (NFRC 100/200): 62 percent.
			9. Total Solar Energy Rejected (TSER) at 60 Degrees (NFRC 100/200): 66 percent.

\*\* NOTE TO SPECIFIER \*\* Delete article if not required or delete film options not required.

* 1. 3M ULTRA PRESTIGE SUN CONTROL FILM
		1. Product: 3M Scotchshield Safety and Security Window Film Ultra Prestige Series.
			1. Performance:
				1. Breaking and Entering Testing: EN 356.
				2. Safety Glazing Testing: ANSI Z97.1, EN 12600, and 16 CFR CPSC 1201.
				3. Bomb Blast and Explosion Protection Testing: ASTM F1642, GSA TS01-2003.
			2. Physical Properties:
				1. Film Type: Ultra Prestige.
				2. Film Thickness: 8 mil (0.22 mm)
				3. Construction: Micro-layered
				4. Tear Resistance: 1,100 lbs
				5. Tensile Strength: 27,000 psi (186 mPa)
				6. Break Strength: 215 lbs/in (956 N/25 mm)
				7. Elongation at Break: 120 percent.
				8. Peel Strength: Greater than 4 lbs/inch (18 N/25 mm)
				9. Abrasion Resistance: Less than 3 percent haze.
		2. Performance, Ultra PR S70 - Film applied to 1/4 Inch (6.4 mm) Thick Clear Glass:
			1. Visible Light Transmission (NFRC 100/200): 68 percent.
			2. Visible Reflection:
				1. Exterior (NFRC 100/200): 10 percent.
				2. Interior (NFRC 100/200): 9 percent.
			3. Ultraviolet Rejection (NFRC 100/200): 99.9 percent.
			4. Solar Heat Reduction: 38 percent.
			5. Solar Heat Gain Coefficient at 90 Degrees (Normal Incidence) (NFRC 100/200): 0.51.
		3. Performance, Ultra PR S70 - Film applied to 1/4 Inch (6.4 mm) Thick Tinted Glass:
			1. Visible Light Transmission (NFRC 100/200): 41 percent.
			2. Visible Reflection:
				1. Exterior (NFRC 100/200): 6 percent.
				2. Interior (NFRC 100/200): 8 percent.
			3. Ultraviolet Light Rejected (NFRC 100/200): 99.9 percent.
			4. Solar Heat Reduction: 30 percent.
			5. Solar Heat Gain Coefficient at 90 Degrees (Normal Incidence) (NFRC 100/200): 0.44.
		4. Performance, Ultra PR S70 - Film applied to 1/4 Inch (6.4 mm) Thick Double Clear Glass:
			1. Visible Light Transmission (NFRC 100/200): 61percent.
			2. Visible Reflection:
				1. Exterior (NFRC 100/200): 16 percent.
				2. Interior (NFRC 100/200): 13 percent.
			3. Ultraviolet Light Rejected (NFRC 100/200): 99.9 percent.
			4. Solar Heat Reduction: 20 percent.
			5. Solar Heat Gain Coefficient at 90 Degrees (Normal Incidence) (NFRC 100/200): 0.56.
		5. Performance, Ultra PR S70 - Film applied to 1/4 Inch (6.4 mm) Thick Double Tinted Glass:
			1. Visible Light Transmission (NFRC 100/200): 37 percent.
			2. Visible Reflection:
				1. Exterior (NFRC 100/200): 9 percent.
				2. Interior (NFRC 100/200): 12 percent.
			3. Ultraviolet Light Rejected (NFRC 100/200): 99.9 percent.
			4. Solar Heat Reduction: 17 percent.
			5. Solar Heat Gain Coefficient at 90 Degrees (Normal Incidence) (NFRC 100/200): 0.42.
		6. Performance, Ultra PR S50 - Film applied to 1/4 Inch (6.4 mm) Thick Clear Glass:
			1. Visible Light Transmission (NFRC 100/200): 48 percent.
			2. Visible Reflection:
				1. Exterior (NFRC 100/200): 9 percent.
				2. Interior (NFRC 100/200): 7 percent.
			3. Ultraviolet Light Rejected (NFRC 100/200): 99.9 percent.
			4. Solar Heat Reduction: 46 percent.
			5. Solar Heat Gain Coefficient at 90 Degrees (Normal Incidence) (NFRC 100/200): 0.44.
		7. Performance, Ultra PR S50 - Film applied to 1/4 Inch (6.4 mm) Thick Tinted Glass:
			1. Visible Light Transmission (NFRC 100/200): 29 percent.
			2. Visible Reflection:
				1. Exterior (NFRC 100/200): 6 percent.
				2. Interior (NFRC 100/200): 7 percent.
			3. Ultraviolet Light Rejected (NFRC 100/200): 99.9 percent.
			4. Solar Heat Reduction: 37 percent.
			5. Solar Heat Gain Coefficient at 90 Degrees (Normal Incidence) (NFRC 100/200): 0.40.
		8. Performance, Ultra PR S50 - Film applied to 1/4 Inch (6.4 mm) Thick Double Clear Glass:
			1. Visible Light Transmission (NFRC 100/200): 43 percent.
			2. Visible Reflection:
				1. Exterior (NFRC 100/200): 15 percent.
				2. Interior (NFRC 100/200): 9 percent.
			3. Ultraviolet Light Rejected (NFRC 100/200): 99.9 percent.
			4. Solar Heat Reduction: 25 percent.
			5. Solar Heat Gain Coefficient at 90 Degrees (Normal Incidence) (NFRC 100/200): 0.53.
		9. Performance, Ultra PR S50 - Film applied to 1/4 Inch (6.4 mm) Thick Double Tinted Glass:
			1. Visible Light Transmission (NFRC 100/200): 26 percent.
			2. Visible Reflection:
				1. Exterior (NFRC 100/200): 9 percent.
				2. Interior (NFRC 100/200): 9 percent.
			3. Ultraviolet Light Rejected (NFRC 100/200): 99.9 percent.
			4. Solar Heat Reduction: 21 percent.
			5. Solar Heat Gain Coefficient at 90 Degrees (Normal Incidence) (NFRC 100/200): 0.40.

\*\* NOTE TO SPECIFIER \*\* Delete the next article if Ceramic Series Sun Control Films are not specified. Retain only films required from the included options. Amazing clarity. Advanced ceramics allow these films to maintain their color and appearance over time. The Ceramic Series films reject up to 80 percent of the sun's infrared light\*(between 900-1000 nm) and reject up to 59 percent of the heat coming through your windows. Ceramic Series films also block 99 percent of UV rays, significantly reducing fading of your furnishings. The Ceramic Series films allow 36 percent to 53 percent of the natural light into your home.
\*\* NOTE TO SPECIFIER \*\* Retain only films required from the included options. Amazing clarity. Advanced ceramics allow these films to maintain their color and appearance over time. The Ceramic Series films reject up to 80 percent of the sun's infrared light\*(between 900-1000 nm) and reject up to 59 percent of the heat coming through your windows. Ceramic Series films also block 99 percent of UV rays, significantly reducing fading of your furnishings. The Ceramic Series films allow 36 percent to 53 percent of the natural light into your home. Delete if not required.

* 1. 3M CERAMIC SUN CONTROL FILM
		1. Physical Properties:
			1. Composition: Optically clear ceramic coated polyester film which may be laminated to a clear polyester film. There shall be an acrylic abrasion resistant coating over the surface of the film for enhanced durability. The film color is derived from a ceramic coating and the product shall not contain dyed polyester.
			2. The ceramic coating shall be uniform without noticeable pin holes, streaks, thin spots and scratches or banding.
			3. The variation in total transmission across the width, at any portion along the length, shall not exceed 2 percent over the average.
			4. The density of the film across the web is not to exceed plus or minus 2 percent. There shall be no evidence of coating voids.
			5. The film shall be identified as to Manufacturer of Origin (hereafter to be called Manufacturer).
		2. Performance, CM 30 - Film applied to 1/4 inch (6.4 mm) Thick Clear Glass:
			1. Visible Light Transmitted 36 percent.
			2. Total Solar Energy Rejected 59 percent.
			3. Solar Heat Gain Coefficient 0.41.
			4. Infrared Rejected 84 percent as measured between 900-1000 nm.
			5. Visible Light Reflected Int. 15 percent.
			6. Visible Light Reflected Ext. 17 percent.
			7. UV Rejected 99 percent.
		3. Performance, CM 40 - Film applied to 1/4 inch (6.4 mm) Thick Clear Glass:
			1. Visible Light Transmitted 44 percent.
			2. Total Solar Energy Rejected 53 percent.
			3. Solar Heat Gain Coefficient 0.47.
			4. Infrared Rejected 78 percent as measured between 900-1000 nm.
			5. Visible Light Reflected Int. 12 percent.
			6. Visible Light Reflected Ext. 14 percent.
			7. UV Rejected 99 percent.
		4. Performance, CM 50 - Film applied to 1/4 inch (6.4 mm) Thick Clear Glass:
			1. Visible Light Transmitted 53 percent.
			2. Total Solar Energy Rejected 47 percent.
			3. Solar Heat Gain Coefficient 0.53.
			4. Infrared Rejected 68 percent as measured between 900-1000 nm.
			5. Visible Light Reflected Int. 10 percent.
			6. Visible Light Reflected Ext. 12 percent.
			7. UV Rejected 99 percent.

\*\* NOTE TO SPECIFIER \*\* Retain only films required from the included options. Traditional metallized films reflect equally both inside and outside, becoming mirror-like at night. The 3M Night Vision line reflects more to the outside, where needed, and less to the inside. 3M high Technology, carbon impregnated polyester layer provides outstanding heat rejection performances. Delete if not required.

* 1. 3M NIGHT VISION SUN CONTROL FILM
		1. Physical Properties:
			1. Composition: Optically clear metallized polyester film. Pressure sensitive adhesive on one side and an acrylic abrasion resistant coating on the other. Also incorporates carbon and/or metal oxide particles.
			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. Thickness: Nominal 2.5 mils (0.125mm) with no evidence of coating voids.
			5. Identification: Labeled as to Manufacturer as listed in this Section.
		2. Performance, NV 15 - Film applied to 1/4 Inch (6.4 mm) Thick Clear Glass:
			1. Visible Light Transmission (NFRC 100/200): 15 percent.
			2. Visible Reflection:
				1. Exterior (NFRC 100/200): 38 percent.
				2. Interior (NFRC 100/200): 11 percent.
			3. Ultraviolet Transmission (NFRC 100/200): Less than 1 percent.
			4. Solar Heat Gain Coefficient at 90 Degrees (Normal Incidence) (NFRC 100/200): 0.28.
		3. Performance, NV 25 - Film applied to 1/4 Inch (6.4 mm) Thick Clear Glass:
			1. Visible Light Transmission (NFRC 100/200): 24 percent.
			2. Visible Reflection:
				1. Exterior (NFRC 100/200): 19 percent.
				2. Interior (NFRC 100/200): 7 percent.
			3. Ultraviolet Transmission (NFRC 100/200): Less than 1 percent.
			4. Solar Heat Gain Coefficient at 90 Degrees (Normal Incidence) (NFRC 100/200): 0.39.
		4. Performance, NV 35 - Film applied to 1/4 Inch (6.4 mm) Thick Clear Glass:
			1. Visible Light Transmission (NFRC 100/200): 36 percent.
			2. Visible Reflection:
				1. Exterior (NFRC 100/200): 13 percent.
				2. Interior (NFRC 100/200): 7 percent.
			3. Ultraviolet Transmission (NFRC 100/200): Less than 1 percent.
			4. Solar Heat Gain Coefficient at 90 Degrees (Normal Incidence) (NFRC 100/200): 0.48.

\*\* NOTE TO SPECIFIER \*\* Delete article if not required or delete film options not required..

* 1. 3M ULTRA NIGHT VISION SUN CONTROL FILM
		1. Product: 3M Scotchshield Safety and Security Window Film Ultra Series.
			1. Performance:
				1. Breaking and Entering Testing: EN 356.
				2. Safety Glazing Testing: ANSI Z97.1, EN 12600, and 16 CFR CPSC 1201.
				3. Bomb Blast and Explosion Protection Testing: ASTM F1642, GSA TS01-2003.
			2. Physical Properties:
				1. Film Type: Ultra Night Vision S25.
				2. Film Thickness: 8 mil (0.22 mm)
				3. Construction: Micro-layered
				4. Tear Resistance: 1,100 lbs
				5. Tensile Strength: 27,000 psi (186 mPa)
				6. Break Strength: 215 lbs/in (956 N/25 mm)
				7. Elongation at Break: 95 percent.
				8. Peel Strength: Greater than 4 lbs/inch (18 N/25 mm)
				9. Abrasion Resistance: 3 percent.
		2. Performance, NV S5 - Film applied to 1/4 Inch (6.4 mm) Thick Clear Glass:
			1. Visible Light Transmission (NFRC 100/200): 24 percent.
			2. Visible Reflection:
				1. Exterior (NFRC 100/200): 24 percent.
				2. Interior (NFRC 100/200): 9 percent.
			3. Ultraviolet Rejection (NFRC 100/200): 99.9 percent.
			4. Solar Heat Reduction: 54 percent.
			5. Solar Heat Gain Coefficient at 90 Degrees (Normal Incidence) (NFRC 100/200): 0.37.
		3. Performance, NV S5 - Film applied to 1/4 Inch (6.4 mm) Thick Tinted Glass:
			1. Visible Light Transmission (NFRC 100/200): 14 percent.
			2. Visible Reflection:
				1. Exterior (NFRC 100/200): 12 percent.
				2. Interior (NFRC 100/200): 9 percent.
			3. Ultraviolet Light Rejected (NFRC 100/200): 99.9 percent.
			4. Solar Heat Reduction: 43 percent.
			5. Solar Heat Gain Coefficient at 90 Degrees (Normal Incidence) (NFRC 100/200): 0.36.
		4. Performance, NV S5 - Film applied to 1/4 Inch (6.4 mm) Thick Double Clear Glass:
			1. Visible Light Transmission (NFRC 100/200): 22 percent.
			2. Visible Reflection:
				1. Exterior (NFRC 100/200): 28 percent.
				2. Interior (NFRC 100/200): 10 percent.
			3. Ultraviolet Light Rejected (NFRC 100/200): 99.9 percent.
			4. Solar Heat Reduction: 33 percent.
			5. Solar Heat Gain Coefficient at 90 Degrees (Normal Incidence) (NFRC 100/200): 0.47.
		5. Performance, NV S5 - Film applied to 1/4 Inch (6.4 mm) Thick Double Tinted Glass:
			1. Visible Light Transmission (NFRC 100/200): 13 percent.
			2. Visible Reflection:
				1. Exterior (NFRC 100/200): 13 percent.
				2. Interior (NFRC 100/200): 10 percent.
			3. Ultraviolet Light Rejected (NFRC 100/200): 99.9 percent.
			4. Solar Heat Reduction: 29 percent.
			5. Solar Heat Gain Coefficient at 90 Degrees (Normal Incidence) (NFRC 100/200): 0.36.

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

* 1. 3M TRADITIONAL SERIES SUN CONTROL FILM
		1. Physical Properties:
			1. Composition: Optically clear metallized polyester film which may be laminated to a clear polyester film. Pressure sensitive adhesive on one side and an acrylic abrasion resistant coating on the other.
			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. Thickness: Nominal 1.5 to 2.5 mils (0.075 to 0.125 mm) with no evidence of coating voids.
			5. Identification: Labeled as to Manufacturer as listed in this Section.
		2. Performance, Silver P-18 - Film applied to 1/4 Inch (6.4 mm) Thick Clear Glass:
			1. Visible Light Transmission (NFRC 100/200/304): 17 percent.
			2. Visible Reflection:
				1. Exterior (NFRC 100/200/304): 56 percent.
				2. Interior (NFRC 100/200/304): 58 percent.
			3. Ultraviolet Transmission (NFRC 100/200/304): Less than 1 percent.
			4. Solar Heat Gain Coefficient at 90 Degrees (Normal Incidence) (NFRC 100/200/304): 0.23.
		3. Performance, Neutral 20 - Film applied to 1/4 Inch (6.4 mm) Thick Clear Glass:
			1. Visible Light Transmission (NFRC 100/200/304): 15 percent.
			2. Visible Reflection:
				1. Exterior (NFRC 100/200/304): 21 percent.
				2. Interior (NFRC 100/200/304): 19 percent.
			3. Ultraviolet Transmission (NFRC 100/200/304): Less than 1 percent.
			4. Solar Heat Gain Coefficient at 90 Degrees (Normal Incidence) (NFRC 100/200/304): 0.38.
		4. Performance, Neutral 35 - Film applied to 1/4 Inch (6.4 mm) Thick Clear Glass:
			1. Visible Light Transmission (NFRC 100/200/304): 36 percent.
			2. Visible Reflection:
				1. Exterior (NFRC 100/200/304): 20 percent.
				2. Interior (NFRC 100/200/304): 18 percent.
			3. Ultraviolet Transmission (NFRC 100/200/304): Less than 1 percent.
			4. Solar Heat Gain Coefficient at 90 Degrees (Normal Incidence) (NFRC 100/200/304): 0.44.
		5. Performance, Neutral 50 - Film applied to 1/4 Inch (6.4 mm) Thick Clear Glass:
			1. Visible Light Transmission (NFRC 100/200/304): 52 percent.
			2. Visible Reflection:
				1. Exterior (NFRC 100/200/304): 12 percent.
				2. Interior (NFRC 100/200/304): 11 percent.
			3. Ultraviolet Transmission (NFRC 100/200/304): Less than 2 percent.
			4. Solar Heat Gain Coefficient at 90 Degrees (Normal Incidence) (NFRC 100/200/304): 0.56.
		6. Performance, Neutral 70 - Film applied to 1/4 Inch (6.4 mm) Thick Clear Glass:
			1. Visible Light Transmission (NFRC 100/200/304): 69 percent.
			2. Visible Reflection:
				1. Exterior (NFRC 100/200/304): 9 percent.
				2. Interior (NFRC 100/200/304): 8 percent.
			3. Ultraviolet Transmission (NFRC 100/200/304): Less than 2 percent.
			4. Solar Heat Gain Coefficient at 90 Degrees (Normal Incidence) (NFRC 100/200/304): 0.68.
		7. Performance, Affinity 15 - Film applied to 1/4 Inch (6.4 mm) Thick Clear Glass:
			1. Visible Light Transmission (NFRC 100/200/304): 9 percent.
			2. Visible Reflection:
				1. Exterior (NFRC 100/200/304): 58 percent.
				2. Interior (NFRC 100/200/304): 25 percent.
			3. Ultraviolet Transmission (NFRC 100/200/304): Less than 1 percent.
			4. Solar Heat Gain Coefficient at 90 Degrees (Normal Incidence) (NFRC 100/200/304): 0.21.
		8. Performance, Affinity 30 - Film applied to 1/4 Inch (6.4 mm) Thick Clear Glass:
			1. Visible Light Transmission (NFRC 100/200/304): 33 percent.
			2. Visible Reflection:
				1. Exterior (NFRC 100/200/304): 29 percent.
				2. Interior (NFRC 100/200/304): 19 percent.
			3. Ultraviolet Transmission (NFRC 100/200/304): Less than 1 percent.
			4. Solar Heat Gain Coefficient at 90 Degrees (Normal Incidence) (NFRC 100/200/304): 0.39.

\*\* NOTE TO SPECIFIER \*\* 3M Exterior Series Sun Control Window Films are designed to be applied to the exterior of the glass.These films utilize a UV durable hardcoat, tested in 3M's world class weathering facilities, to deliver the durability you require.The 3M Exterior Prestige Series Window Films, provides the benefits of a world-class window film while leaving the beauty of your windows virtually unchanged. Because 3M Exterior Prestige Window Films use no metals, they are not susceptible to corrosion including coastal environments and do not interfere with mobile phone reception. 3M Prestige Window Films offer reflectivity that is actually lower than glass. The 3M Exterior Traditional Series Window Films utilize a metalized layer to provide solar performance as well as a reflective look to the glass. Delete if not required.

* 1. 3M EXTERIOR SERIES SUN CONTROL FILM
		1. Physical Properties:

\*\* NOTE TO SPECIFIER \*\* Delete Composition series not required.

* + - 1. Composition Exterior Prestige Series: Optically clear polyester film containing at least 220 layers and incorporating pressure sensitive adhesive on one side and an exterior weatherable abrasion resistant coating on the other. Nanotechnology represents a breakthrough in technology due to the enhanced heat, UV and IR rejection, without the presence of any metals. The film does not contain dyes.
			2. Composition Exterior Traditional Series: Optically clear metallized polyester film which may be laminated to a clear polyester film. Pressure sensitive adhesive on one side and an exterior durable abrasion resistant coating on the other.
			3. Uniformity: No noticeable pin holes, streaks, thin spots, scratches, banding or other optical defects.
			4. Variation in Total Transmission across the Width: Less than 2 percent over the average at any portion along the length.
			5. Thickness: Nominal 2.0 mils (0.1 mm) with no evidence of coating voids.
			6. Identification: Labeled as to Manufacturer as listed in this Section.
		1. Performance, Exterior Prestige 90 - Clear Film, nanotechnology, no metal and at least 220 plus layers applied to 1/4 Inch (6.4 mm) Thick Clear Glass:
			1. Visible Light Transmission (NFRC 100/200): 88 percent.
			2. Visible Reflection - Exterior (NFRC 100/200): 9 percent.
			3. Visible Reflection - Interior (NFRC 100/200): 9 percent.
			4. Ultraviolet Rejected (NFRC 100/200): 99.9 percent.
			5. Infrared Energy Rejected (NFRC 100/200): up to 97 percent; as measured between 900-1000 nm.
			6. Light to Solar Gain Ratio: 1.4.
			7. Solar Heat Gain Coefficient at 90 Degrees (Normal Incidence) (NFRC 100/200): 0.64.
			8. Total Solar Energy Rejected (TSER) at 90 Degrees (Normal Incidence) (NFRC 100/200): 36 percent.
			9. Total Solar Energy Rejected (TSER) at 60 Degrees (NFRC 100/200): 45 percent.
		2. Performance, Exterior Prestige 70 - Clear Film, nanotechnology, no metal and at least 220 plus layers applied to 1/4 Inch (6.4 mm) Thick Clear Glass:
			1. Visible Light Transmission (NFRC 100/200): 71 percent.
			2. Visible Reflection - Exterior (NFRC 100/200): 7 percent.
			3. Visible Reflection - Interior (NFRC 100/200): 7 percent.
			4. Ultraviolet Rejected (NFRC 100/200): 99.9 percent.
			5. Infrared Energy Rejected (NFRC 100/200): up to 97 percent; as measured between 900-1000 nm.
			6. Light to Solar Gain Ratio: 1.5.
			7. Solar Heat Gain Coefficient at 90 Degrees (Normal Incidence) (NFRC 100/200): 0.48.
			8. Total Solar Energy Rejected (TSER) at 90 Degrees (Normal Incidence) (NFRC 100/200): 52 percent.
			9. Total Solar Energy Rejected (TSER) at 60 Degrees (NFRC 100/200): 61 percent.
		3. Performance, Exterior Prestige 40 - Tinted Film, nanotechnology, no metal and at least 220 plus layers applied to 1/4 Inch (6.4 mm) Thick Clear Glass:
			1. Visible Light Transmission (NFRC 100/200): 39 percent.
			2. Visible Reflection - Exterior (NFRC 100/200): 6 percent.
			3. Visible Reflection - Interior (NFRC 100/200): 5 percent.
			4. Ultraviolet Rejected (NFRC 100/200): 99.9 percent.
			5. Infrared Energy Rejected (NFRC 100/200): up to 97 percent; as measured between 900-1000 nm.
			6. Light to Solar Gain Ratio: 1.1.
			7. Solar Heat Gain Coefficient at 90 Degrees (Normal Incidence) (NFRC 100/200): 0.39.
			8. Total Solar Energy Rejected (TSER) at 90 Degrees (Normal Incidence) (NFRC 100/200): 61 percent.
			9. Total Solar Energy Rejected (TSER) at 60 Degrees (NFRC 100/200): 68 percent.
		4. Performance, Exterior Silver 15 - Tinted Reflective Film, applied to 1/4 Inch (6.4 mm) Thick Clear Glass:
			1. Visible Light Transmission (NFRC 100/200): 17 percent.
			2. Visible Reflection - Exterior (NFRC 100/200): 61 percent.
			3. Visible Reflection - Interior (NFRC 100/200): 56 percent.
			4. Ultraviolet Rejected (NFRC 100/200): 99 percent.
			5. Light to Solar Gain Ratio: 0.9.
			6. Solar Heat Gain Coefficient at 90 Degrees (Normal Incidence) (NFRC 100/200): 0.19.
			7. Total Solar Energy Rejected (TSER) at 90 Degrees (Normal Incidence) (NFRC 100/200): 81 percent.
		5. Performance, Exterior Neutral 35 - Tinted Reflective Film, applied to 1/4 Inch (6.4 mm) Thick Clear Glass:
			1. Visible Light Transmission (NFRC 100/200): 44 percent.
			2. Visible Reflection - Exterior (NFRC 100/200): 10 percent.
			3. Visible Reflection - Interior (NFRC 100/200): 13 percent.
			4. Ultraviolet Rejected (NFRC 100/200): 99 percent.
			5. Light to Solar Gain Ratio: 0.9.
			6. Solar Heat Gain Coefficient at 90 Degrees (Normal Incidence) (NFRC 100/200): 0.49.
			7. Total Solar Energy Rejected (TSER) at 90 Degrees (Normal Incidence) (NFRC 100/200): 51 percent.

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

* 1. 3M MICRO-REPLICATED DAYLIGHT REDIRECTING FILM
		1. Physical Properties:
			1. Composition: Polyester film with a translucent micro-replicated structure on one surface and pressure sensitive adhesive on the opposite side.
				1. Film color: off-white, translucent.
				2. Thickness: nominal 8.4 mils (0.21 mm).
			2. Uniformity: No noticeable pin holes, streaks, thin spots, scratches, banding or other optical defects.
			3. Identification: Labeled as to Manufacturer as listed in this Section.
		2. Performance Properties as applied to 1/8 Inch (6.4 mm) Thick Clear Glass:
			1. Visible Light Transmission (NFRC 100/200, ASTM E 308): 80.5 percent.
			2. Visible Reflection - Exterior (NFRC 100/200): 10 percent.
			3. Visible Reflection - Interior (NFRC 100/200): 17 percent.
			4. Ultraviolet Rejected (NFRC 100/200): 99 percent.
			5. Upward Light Redirection at 37 deg. Incident angle (IES LM-83-12): >75%.
			6. Solar Heat Gain Coefficient (Normal Incidence) (NFRC 100/200): 0.80.
	2. 3M ALL SEASON SUN CONTROL WINDOW FILM
		1. Physical Properties:
			1. Composition: Optically clear metallized polyester with pressure sensitive adhesive on one side and an abrasion resistant coating on the other.
			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.
		2. Performance, Low E 20 (LE20) - Film applied to 1/4 Inch (6.4 mm) Thick Clear Glass:
			1. Visible Light Transmission (NFRC 100/200/304): 20 percent.
			2. Visible Reflection:
				1. Exterior (NFRC 100/200/304): 53 percent.
				2. Interior (NFRC 100/200/304): 58 percent.
			3. Ultraviolet Rejection (NFRC 100/200/304): 99.9 percent.
			4. Light to Solar Gain ratio: 0.8.
			5. Solar Heat Gain Coefficient at 90 Degrees (Normal Incidence) (NFRC 100/200/304): 0.24.
			6. U value (NFRC 100/200/304): 0.77 BTU/h/sq ft.
			7. Thickness: Nominal 3.5 mils (.089 mm) with no evidence of coating voids.
		3. Performance, Low E 35 - Film applied to 1/4 Inch (6.4 mm) Thick Clear Glass:
			1. Visible Light Transmission (NFRC 100/200/304): 30 percent.
			2. Visible Reflection:
				1. Exterior (NFRC 100/200/304): 54 percent.
				2. Interior (NFRC 100/200/304): 60 percent.
			3. Ultraviolet Transmission (NFRC 100/200/304): Less than 1 percent.
			4. Solar Heat Gain Coefficient at 90 Degrees (Normal Incidence) (NFRC 100/200/304): 0.25.
			5. U value (NFRC 100/200/304): 0.85 BTU/h/sq ft.
			6. Thickness: Nominal 1.5 mils to 2.5 mils (0.075mm to 0.125mm) with no evidence of coating voids.
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, GENERAL
		1. General: Install in accordance with manufacturer's instructions and the following.
			1. 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.
			2. 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.
			3. Apply film to glass and lightly spray film with slip solution.
			4. Squeegee from top to bottom of window.
			5. Bump film edge with lint-free towel wrapped around edge of a 5-way tool.
			6. 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.
			7. 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