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:  
3M Center Bldg. 223  
St. Paul, MN 55144-1000  
Toll Free Tel: 888-650-3497  
Tel: 651-737-1081  
Fax: 651-737-8241  
Email: [request info (apeters2@mmm.com)](https://admin.arcat.com/users.pl?action=UserEmail&company=3M+Commercial+Solutions&coid=47922&rep=&fax=651-737-8241&message=RE:%20Spec%20Question%20(08870mmm):%20%20&mf=)  
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://www.3m.com/3M/en_US/building-window-solutions-us>   
  
 [ [Click Here](https://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.  
3M Impact Protection Attachment 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 percent. 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 Film:
       1. Clear microlayered film. (Prestige 70) (Prestige 60) (Prestige 50) (Prestige 40) (Prestige 20)
       2. Safety and Security Window Film. (Ultra PR S70) (Ultra PR S50)
       3. Clear ceramic laminated film. (CM 30) (CM 40) (CM 50)
       4. Night vision metallized film. (NV 15) (NV 25) (NV 35)
       5. Ultra Night vision metallized film. (NV S5)
       6. Traditional series metalized film. (Silver P-18) (Neutral 20) (Neutral 35) (Neutral 50) (Neutral 70) (Affinity 15) (Affinity 30)
       7. Exterior series film. (Exterior Prestige 90) (Exterior Prestige 70) (Exterior Prestige 40) (Exterior Silver 15) (Exterior Neutral 35)
       8. All Season sun control film. (Low E 20) (Low E 35)
    2. Safety and Security Window Film:
       1. Clear microlayered film. (Ultra S800).
       2. Clear safety film. (Safety S40) (Safety S70) (Safety S80) (Safety S140) (Safety S20X Exterior) (Safety S40X Exterior) (Safety S70X Exterior)
       3. Safety and sun control film. (Safety Silver S20) (Safety Neutral S35)
       4. Anti-graffiti film. (AG4) (AG6)
       5. Impact protection attachment systems. (IPA)
    3. Architectural Window Film:
       1. Combination patterned film (Fasara). (Illumina Glace) (Illumina Glace 2)
       2. Line patterned film (Fasara). (Fine) (Lattice Glace) (Slat Glace)
       3. Single patterned film (Fasara). (Mat Crystal) (Milky White) (Milky Milky)
       4. Gradation pattern film (Fasara). (Illumina) (Illumina-g) (Illumina-P) (Illumina Silver) (Illumina Black) (Aerina) (Venetian) (Robe) (Lontano) (Sabrina) (Tsurugi)
       5. Stripe pattern film (Fasara). (Nokto) (Radius) (Shutie) (Shutie Black) (Arpa) (Arpa Black) (Seattle) (Seattle Fine) (Fine)
       6. Border/Horizontal pattern film (Fasara). (Lattice) (Lattice-g) (Slat) (Slat-g) (Pixela) (Paracell) (Leise)
       7. Prism/Dot pattern film (Fasara). (Prism Noir) (Prism Silver) (Astral Silver) (Cielo) (Luna 6) (Luna 9) (Aura 9) (Vista) (SHIZUKU) (KANON)
       8. Fabric/Japan Paper pattern film (Fasara). (Linen) (Altair) (Vega) (SAGANO) (SAFU) (YAMOTO) (KEN-UN) (RIKYU)
       9. Frost/Matte and Mirror pattern film (Fasara). (ESSEN) (LAUSANNE) (OSLO) (OSLO-P) (CHAMONIX) (Opaque White) (Fine Crystal) (Luce) (Mat Crystal-1) (Mat Crystal 2) (Milky White (Milano)) (Milky Milky (San Marino)) (Glace) (Milky Crystal) (Mare) (Opaque Black) (Silver 1)
       10. Single patterned film (3M CRYSTAL Glass Finishes). (Dusted) (Frosted).
       11. Decorative Pattern: Custom-Printed per project (by other than Manufacturer) (3M Decorative Polyester Glass Finish Film).
       12. Transmissive/Reflective Color Pattern: 3M DICHROIC DF-PA Film. (Blaze) (Chill).
  1. 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

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

* + 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 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 2582 - Standard Test Method for Puncture-Propagation Tear Resistance of Plastic Film and Thin Sheeting.
       7. ASTM D 5895 - Standard Test Methods for Evaluating Drying or Curing During Film Formation of Organic Coatings Using Mechanical Recorders.
       8. ASTM D 4830 - Standard Test Methods for Characterizing Thermoplastic Fabrics Used in Roofing and Waterproofing.
       9. ASTM E 84 - Standard Method of Test for Surface Burning Characteristics of Building Materials.
       10. ASTM E 308 - Standard Recommended Practice for Spectrophotometry and Description of Color in CIE 1931 System.
       11. ASTM E 903 - Standard Methods of Test for Solar Absorbance, Reflectance and Transmittance of Materials Using Integrating Spheres.
       12. 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.
       13. ASTM E 1996 - Standard Specification for Performance of Exterior Windows, Curtain Walls, Doors and Impact Protective Systems Impacted by Windborne Debris in Hurricanes.
       14. ASTM F1642 - Standard Method of Test for Glazing and Glazing Systems Subject to Airblast Loadings
       15. ASTM F2912 - 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. IES LM-83-12: IES Spatial Daylight Autonomy (sDA) and Annual Sunlight Exposure.
    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.
    10. Window 6.3 - A Computer Tool for Analyzing Window Thermal Performance; Lawrence Berkeley Laboratory.

\*\* NOTE TO SPECIFIER \*\* Delete next paragraph if sun control film is not required.

* 1. DEFINITIONS
     1. Light to Solar Gain Ratio: The ratio of visible light transmission to Solar Heat Gain Coefficient.

\*\* NOTE TO SPECIFIER \*\* Delete performance requirements not applicable to products selected

* 1. PERFORMANCE REQUIREMENTS

\*\* NOTE TO SPECIFIER \*\* Edit performance requirements as necessary depending on project requirements or film specified. Coordinate with product data in Section 2.

* + 1. Safety Glazing Impact Performance:

\*\* NOTE TO SPECIFIER \*\* Impact Resistance is a performance based test for safety glazing. Manufacturer shall demonstrate compliance with the performance requirements through submittal of 3rd party test reports. Testing shall be provided on 1/4 inch annealed glass, although reports on other glass substrates may be additionally provided if representative of project conditions. The test report shall state compliance with both ANSI Z97.1 and 16 CFR 1201 standards and show that the film has successfully met 400 ft-lbs impact requirements on at least 4 test specimens. The 400 ft-lbs impact force is generated from a 100-lb impactor drop height of 48-inches, which is required for ANSI Z97.1 Class A (Unlimited) and 16 CFR 1201 Category 2 impact ratings, as referenced in building code.

\*\* NOTE TO SPECIFIER \*\* The following paragraphs apply to Clear Microlayered Safety and Security Window Films: Ultra S800 Clear Microlayered Safety and Security Window Films. Delete if not required.

* + - 1. 400 ft-lbs impact resistance, meeting ANSI Z97.1 (Class A, Unlimited) and 16 CFR 1201 (Category 2) impact requirements with film applied on 1/4 inch annealed glass.
      2. 400 ft-lbs impact resistance, meeting ANSI Z97.1 (Class A, Unlimited) and 16 CFR 1201 (Category 2) impact requirements with film applied on 1/8 inch annealed glass.

\*\* NOTE TO SPECIFIER \*\* The following paragraph applies to Clear Safety and Security Window Films, 3M Safety S40 and Safety S70. Delete if not required.

* + - 1. 150 ft-lbs impact resistance, meeting ANSI Z97.1 (Class B, Unlimited) and 16 CFR 1201 (Category 1) impact requirements with film applied on 1/4 inch annealed glass.
      2. 150 ft-lbs impact resistance, meeting ANSI Z97.1 (Class B, Unlimited) and 16 CFR 1201 (Category 1) impact requirements with film applied on 1/8 inch annealed glass.

\*\* NOTE TO SPECIFIER \*\* The following paragraph applies to Clear Safety and Security Window Films, 3M Safety S80 and Safety S140. Delete if not required.

* + - 1. 400 ft-lbs impact resistance, meeting ANSI Z97.1 (Class A, Unlimited) or 16 CFR 1201 (Category 2) impact requirements with film applied on 1/4 inch annealed glass.
      2. 400 ft-lbs impact resistance, meeting ANSI Z97.1 (Class A, Unlimited) or 16 CFR 1201 (Category 2) impact requirements with film applied on 1/8 inch annealed glass.

\*\* NOTE TO SPECIFIER \*\* The following paragraph applies to Clear Safety and Security Window Films, 3M Safety Exterior Series, S40X and S70X. Delete if not required.

* + - 1. 150 ft-lbs impact resistance, meeting ANSI Z97.1 (Class B, Unlimited) and 16 CFR 1201 (Category 1) impact requirements with film applied on 1/4 inch annealed glass.
      2. 150 ft-lbs impact resistance, meeting ANSI Z97.1 (Class B, Unlimited) and 16 CFR 1201 (Category 1) impact requirements with film applied on 1/8 inch annealed glass.
    1. Blast Hazard Mitigation Performance:

\*\* NOTE TO SPECIFIER \*\* High explosive arena blast testing and shock tube testing are performance based methods for evaluating safety and security films for blast hazard mitigation. Manufacturer shall provide 3rd party test reports or a data sheet summary with specific reference to a 3rd party test report showing the product complies with the referenced standards. The submittal shall indicate the blast load tested (blast pressure and impulse), film product tested, film attachment method, glass substrate tested, and performance rating achieved.  
Frequently specified blast performance standards are GSA TS01 and ASTM F1642. GSA TS01 performance conditions are as follows: Level "3B" = Low Hazard; Level "3A" = Very Low Hazard; and Level "2" = No Hazard. A common minimum specified level of protection is "3B"; therefore in comparison, products with GSA "3A" or "2" ratings exceed this level.  
DELETE any of the following paragraphs not applicable for the project.

\*\* NOTE TO SPECIFIER \*\* The following paragraphs apply to Clear Microlayered Safety and Security Window Films, Ultra S800. Delete if not required.

* + - 1. GSA Rating of "2" / ASTM F1642 "No Hazard" with target blast pressure of 6 psi and 42 psi\*msec blast impulse, on 1/4 inch annealed single pane glass and 3M Impact Protection Attachment Sealant.
      2. GSA Rating of "2" / ASTM F1642 "No Hazard" with target blast pressure of 6 psi and 42 psi\*msec blast impulse, on 1/4 inch tempered single pane glass with 3M Impact Protection Attachment Sealant.
      3. GSA Rating of "2" / ASTM F1642 "No Hazard" with target blast pressure of 6 psi and 42 psi\*msec blast impulse, on 1 inch annealed double pane glass with 3M Impact Protection Attachment Sealant.
      4. GSA Rating of "2" / ASTM F1642 "No Hazard" with target blast pressure of 9 psi and 60 psi\*msec blast impulse, on 1 inch annealed double pane glass with 3M Impact Protection Attachment Sealant.
      5. GSA Rating of "2" / ASTM F1642 "No Hazard" with target blast pressure of 9 psi and 60 psi\*msec blast impulse, on 1 inch tempered double pane glass with 3M Impact Protection Attachment Sealant.
      6. GSA Rating of "3a" / ASTM F1642 "Minimal Hazard" with target blast pressure of 6 psi and 42 psi\*msec blast impulse, on 1 inch tempered double pane glass with 3M Impact Protection Attachment Sealant (on 2 sides only).
      7. GSA Rating of "3b" with blast pressure of 9.4 psi and 55 psi\*msec blast impulse, on 1/4 inch annealed single pane glass and 3M Impact Protection Attachment Sealant.
      8. GSA Rating of "2" with blast pressure of 7.8 psi and 55 psi\*msec blast impulse, on 1" tempered double pane glass with 3M Impact Protection Attachment Sealant.
      9. GSA Rating of "3a" with blast pressure of 6 psi and 42 psi\*msec blast impulse, on 1/4 inch tempered single pane glass with 3M Impact Protection Attachment Sealant (on 2 sides only).

\*\* NOTE TO SPECIFIER \*\* The following paragraphs apply to Clear Safety and Security Window Film: 3M Safety S80. Delete if not required.

* + - 1. GSA Rating of "3B" / ASTM F1642 "Minimal Hazard" with minimum blast load of 6 psi and 41 psi\*msec, on 1/4 inch (6 mm) single pane glass and film attachment system.
      2. GSA Rating of "3B" with minimum blast load of 4 psi and 29 psi\*msec, on 1/4 inch (6 mm) pane glass without film attachment system.

\*\* NOTE TO SPECIFIER \*\* The following paragraph applies to Clear Safety and Security Window Film: 3M Safety S140. Delete if not required.

* + - 1. GSA Rating of "3B" with minimum blast load of 15 psi and 59 psi\*msec, on 1 inch (25 mm) double pane glass without film attachment system.

\*\* NOTE TO SPECIFIER \*\* IMPORTANT NOTICE: These products are not approved in the State of Florida for use as hurricane, windstorm, or impact protection from wind-borne debris from a hurricane or windstorm. In compliance with Florida Statute 553.842, these products may not be advertised, sold, offered, provided, distributed, or marketed in the State of Florida as hurricane, windstorm, or impact protection from wind-borne debris from a hurricane or windstorm. DELETE this section if project is located in the State of Florida.  
Impact and pressure cycling are performance based tests for building envelope protection. Manufacturer shall provide 3rd party test reports showing the product complies with the impact and pressure cycling requirements of ASTMs E1886 / E1996. Glazing systems vary, contact Manufacturer for more information.

* + 1. Impact Resistance and Pressure Cycling:

\*\* NOTE TO SPECIFIER \*\* The following paragraphs apply to Clear Microlayered Safety and Security Window Films, Ultra S800. Delete if not required.

* + - 1. ASTM E1996 / E1886: Large Missile "C", plus or minus 75 psf Design Pressure.

\*\* NOTE TO SPECIFIER \*\* The following paragraph applies to Safety and Security Window Films with Sun Control: Safety Silver S20. Delete if not required.

* + - 1. ASTM E1996 / E1886: Small Missile "A", plus or minus 60 psf Design Pressure.
    1. 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 percent), which represents total energy absorbed.

\*\* NOTE TO SPECIFIER \*\* The following paragraphs apply to Clear Microlayered Safety and Security Window Films, Ultra S800. Delete if not required.

* + - 1. Minimum Graves Area Tear Strength of 1,050 lbs percent 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 Clear Microlayered Safety and Security Window Film, Ultra S800. Delete if not required.

* + - 1. Minimum 9 lbs/in peel strength per ASTM D3330 (Method A).

\*\* NOTE TO SPECIFIER \*\* The following paragraph applies to Clear Safety and Security Window Film: 3M Safety S40. Delete if not required.

* + - 1. Nominal 4 lbs/in peel strength per ASTM D3330 (Method A).

\*\* NOTE TO SPECIFIER \*\* The following paragraph applies to Clear Safety and Security Window Film: 3M Safety S70. Delete if not required.

* + - 1. Nominal 5 lbs/in peel strength per ASTM D3330 (Method A).

\*\* NOTE TO SPECIFIER \*\* The following paragraph applies to Clear Safety and Security Window Films: 3M Safety S80 and Safety S140. Delete if not required.

* + - 1. Minimum 2 lbs/in peel strength per ASTM D3330 (Method A).

\*\* NOTE TO SPECIFIER \*\* The following paragraph applies to Clear Safety and Security Window Films: 3M Safety Exterior S20X. Delete if not required.

* + - 1. Nominal 4 lbs/in peel strength per ASTM D3330 (Method A).

\*\* NOTE TO SPECIFIER \*\* The following paragraph applies to Clear Safety and Security Window Films: 3M Safety Exterior S40X. Delete if not required.

* + - 1. Nominal 4 lbs/in peel strength per ASTM D3330 (Method A).

\*\* NOTE TO SPECIFIER \*\* The following paragraph applies to Clear Safety and Security Window Films: 3M Safety Exterior S70X. Delete if not required.

* + - 1. Nominal 5 lbs/in peel strength per ASTM D3330 (Method A).

\*\* NOTE TO SPECIFIER \*\* The following paragraph applies to Safety and Security Window Films with Sun Control: 3M Safety Silver S20 and Safety Neutral S35. Delete if not required.

* + - 1. Minimum 3 lbs/in peel strength per ASTM D3330 (Method A).

\*\* NOTE TO SPECIFIER \*\* The following paragraph applies to Anti-Graffiti Films: 3M AG4 and AG6. Delete if not required.

* + - 1. Nominal 1 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 paragraph applies to Clear Microlayered Safety and Security Window Film S800. Delete if not required.

* + - 1. Film shall have a surface coating that is resistant to abrasion such that less than 5 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.

\*\* NOTE TO SPECIFIER \*\* The following paragraph applies to Clear Safety and Security Window Films: 3M Safety S40, Safety S70, Safety S80, and Safety S140. Delete if not required.

* + - 1. Film shall have a surface coating that is resistant to abrasion such that less than 5 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.

\*\* NOTE TO SPECIFIER \*\* The following paragraph applies to Clear Safety and Security Window Films: Safety Exterior S20X, Safety Exterior S40X, and Safety Exterior S70X. Delete if not required.

* + - 1. Film shall have a surface coating that is resistant to abrasion such that a nominal 5 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.

\*\* NOTE TO SPECIFIER \*\* The following paragraph applies to Safety and Security Window Films with Sun Control: 3M Safety Neutral S35 and Safety Silver S20. Delete if not required.

* + - 1. Film shall have a surface coating that is resistant to abrasion such that a nominal 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.

\*\* NOTE TO SPECIFIER \*\* The following paragraph applies to Anti-Graffiti Films: 3M AG 4 and AG6. Delete if not required.

* + - 1. Film shall have a surface coating that is resistant to abrasion such that less than 2 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 paragraph applies to Clear Microlayered Safety and Security Window Film S800. Delete if not required.

* + - 1. Minimum of 99 percent UV light rejection (300 - 380 nm), per ASTM E903, as determined with film applied on 1/4 inch clear glass.

\*\* NOTE TO SPECIFIER \*\* The following paragraph applies to Clear Safety and Security Window Films: 3M Safety S40, Safety S70, Safety S80, and Safety S140. Delete if not required.

* + - 1. Minimum of 99 percent UV light rejection (300 - 380 nm), per ASTM E903, as determined with film applied on 1/4 inch clear glass.

\*\* NOTE TO SPECIFIER \*\* The following paragraph applies to Clear Safety and Security Window Films: Safety Exterior S20X, Safety Exterior S40X, and Safety Exterior S70X. Delete if not required.

* + - 1. Minimum of 99 percent UV light rejection (300 - 380 nm), per ASTM E903, as determined with film applied on 1/4 inch clear glass.

\*\* NOTE TO SPECIFIER \*\* The following paragraph applies to Safety and Security Window Films with Sun Control: 3M Safety Neutral S35 and Safety Silver S20. Delete if not required.

* + - 1. Minimum of 99 percent 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 Film Ultra S800. 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 \*\* The following paragraphs apply to Clear Safety and Security Window Films: Safety S40, Safety Exterior S20X, Safety Exterior S40X. 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. Safety Glazing Impact Testing, ANSI Z97.1 or 16 CFR 1201.

\*\* NOTE TO SPECIFIER \*\* The following paragraphs apply to Clear Safety and Security Window Films: Safety S70, Safety S80, Safety Exterior S70X. 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. Puncture Strength Testing, ASTM D4830.
      6. Safety Glazing Impact Testing, ANSI Z97.1 or 16 CFR 1201.

\*\* NOTE TO SPECIFIER \*\* The following paragraphs apply to Clear Safety and Security Window Films: Safety S140. 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. Puncture Strength Testing, ASTM D4830.
      6. Burglary Resistance Glazing, UL 972.

\*\* NOTE TO SPECIFIER \*\* The following paragraphs apply to Safety and Security Films with Sun Control: Safety Neutral S35 and Safety Silver S20. Delete if not required.

* + - 1. Flammability Testing, ASTM E84.
      2. Safety Glazing Impact Testing, ANSI Z97.1 and 16 CFR 1201.

\*\* NOTE TO SPECIFIER \*\* The following paragraphs apply to Anti-Graffiti Films: AG4 and AG6. 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. Puncture Strength Testing, ASTM D4830.

\*\* NOTE TO SPECIFIER \*\* DELETE the following paragraph if project is located in the State of Florida or if intended product use is not for wind borne debris protection.

\*\* NOTE TO SPECIFIER \*\* IMPORTANT NOTICE: These products are not approved in the State of Florida for use as hurricane, windstorm, or impact protection from wind-borne debris from a hurricane or windstorm. In compliance with Florida Statute 553.842, these products may not be advertised, sold, offered, provided, distributed, or marketed in the State of Florida as hurricane, windstorm, or impact protection from wind-borne debris from a hurricane or windstorm. DELETE this section if project is located in the State of Florida.

\*\* NOTE TO SPECIFIER \*\* The following paragraph applies only to: Clear Microlayered Safety and Security Window Film Ultra S800; Safety and Security Films with Sun Control: Safety Silver S20 and Safety Neutral S35. Delete if not required.

* + - 1. Impact Resistance and Pressure Cycling, ASTMs E1886 and E1996.

\*\* NOTE TO SPECIFIER \*\* DELETE the following paragraph if project if intended product use is not for blast hazard mitigation.

\*\* NOTE TO SPECIFIER \*\* The following paragraph applies only to: Clear Microlayered Safety and Security Window Film Ultra S800; Clear Safety and Security Window Films: S80 and S140. Delete if not required.

* + - 1. Blast Hazard Mitigation Testing, ASTM F1642 / F2912 and/or GSA-TS01-2003.
    1. Other Product Submittals:

\*\* NOTE TO SPECIFIER \*\* DELETE any of the following submittals if primary product use is not for blast protection and/or forced entry resistance.

\*\* NOTE TO SPECIFIER \*\* The following paragraph applies only to: Clear Microlayered Safety and Security Window Film Ultra S800; Clear Safety and Security Window Films: S80 and S140. Delete if not required.

* + - 1. Manufacturer's summary of 3rd Party Blast Hazard Mitigation Testing, ASTM F1642 / F2912 and/or GSA-TS01-2003

\*\* NOTE TO SPECIFIER \*\* The following paragraph applies only to: Clear Safety and Security Window Film, 3M Safety S140. Delete if not required.

* + - 1. 3rd Party test reports from Forced Entry Resistance evaluations.

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

* + 1. Verification Samples: For each film specified, two samples representing actual film color and pattern.

\*\* NOTE TO SPECIFIER \*\* Retain the next paragraph only if Sun Control Film is specified.

* + 1. 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.

\*\* NOTE TO SPECIFIER \*\* RETAIN the following paragraph only for Safety and Security Films with Sun Control: 3M Safety Silver S20 and Safety Neutral S35. 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 \*\* 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.

\*\* NOTE TO SPECIFIER \*\* Delete the next paragraph if not required.

* + 1. Anti-graffiti films are warranted for a period of 1 year when installed outdoors and for a period of 10 years when installed indoors.

1. PRODUCTS
   1. MANUFACTURERS
      1. Acceptable Manufacturer: 3M Commercial Solutions, which is located at: 3M Center Bldg. 223; St. Paul, MN 55144-1000; Toll Free Tel: 888-650-3497; Tel: 651-737-1081; Fax: 651-737-8241; Email: [request info (apeters2@mmm.com)](https://admin.arcat.com/users.pl?action=UserEmail&company=3M+Commercial+Solutions&coid=47922&rep=&fax=651-737-8241&message=RE:%20Spec%20Question%20(08870mmm):%20%20&mf=); 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://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 the next article if Prestige Sun Control Films are not specified.

* 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): 61 percent.
        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.

* 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, 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 \*\* Delete the next article if Night Vision Sun Control Films are not specified. 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.

* 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 (0.125 mm) 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 mils to 2.5 mils (0.075 mm 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. 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 (0.1mm) 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 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. Thickness: Nominal 3.5 mils (.089 mm) with no evidence of coating voids.
        7. U value (NFRC 100/200/304): 0.77 BTU/hft2.
     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.

\*\* NOTE TO SPECIFIER \*\* Delete the entire next article if not required.

* 1. CLEAR MICROLAYERED SAFETY AND SECURITY WINDOW FILM
     1. 3M Scotchshield Ultra S800 Safety and Security Window Film. Optically clear microlayered polyester film, nominally 8 mils (0.008 inch) thick, with a durable acrylic abrasion resistant coating over one surface and a pressure sensitive adhesive on the other. The film is clear and does not contain dyed polyester. The adhesive is pressure-activated, not water-activated, and forms a physical bond, not chemical bond, to the glass. The film is microlayered with both plastic and ductile polyester layers for tear resistance.
        1. Physical / Mechanical Performance Properties (nominal):

\*\* NOTE TO SPECIFIER \*\* While performance testing of film on glass is preferred approach for evaluating a safety film product, film tensile and mechanical properties are frequently specified. Where specified, it is important to note that results depend on several factors, including film orientation and tested product construction (i.e, with or without film coatings). Bi-directionally balanced film properties are important for safety and security applications because product failure in any one direction could have catastrophic effects. Therefore a film's strength properties are governed by the lower of two values in either direction: machine direction (MD); or transverse direction (TD).  
Product Submittals shall meet the full testing and reporting requirements of ASTM D882, with data reported separately for both film directions, so the balance of film properties can be determined. Tested product construction should be noted; properties of the coated film are most relevant since this is the product form installed in the field. Singularly reported values for film mechanical properties (tensile & break strength, or elongation) do NOT meet reporting requirements of ASTM D882 and are not indicative of the balance of properties.

* + - * 1. Film Color: Clear.
        2. Film Thickness (excluding coatings or adhesive liner): Nominal 8 mils
        3. Tensile Strength (ASTM D882):

Coated Film: 33,000 psi (MD) / 30,000 psi (TD).

* + - * 1. Break Strength (ASTM D882):

Coated Film: 265 lb/in (MD) / 240 lb/in (TD).

* + - * 1. Percent Elongation at Break (ASTM D882):

Coated Film: 140 percent (MD) / 130 percent (TD).

* + - * 1. Yield Strength:

Coated Film: 15,000 psi (MD).

* + - * 1. Percent Elongation at Yield (ASTM D882):

Coated Film: 8 percent (MD).

* + - * 1. Graves Tear Resistance (ASTM D1004):

Maximum Force (lbs):

Coated Film: 37 (MD) / 37 (TD).

Maximum Extension (in):

Coated Film: 0.50 (MD) / 0.51 (TD).

Graves Area Tear Resistance (lbs-percent):

Coated Film: 1,100 (MD) / 1,050 (TD).

* + - * 1. Puncture Propagation Tear Resistance (ASTM D2582):

Coated Film: 9 lbf (MD) / 11 lbf (TD).

* + - * 1. Puncture Strength (ASTM D4830):

Material Properties (as supplied).

Coated Film: 190 lbf.

* + - 1. Uniformity: No noticeable pin holes, streaks, thin spots, scratches, banding or other optical defects.
      2. Variation in Total Transmission across the width: Less than 2 percent over the average at any portion along the length.
      3. Identification: Labeled as to Manufacturer as listed in this Section.

\*\* NOTE TO SPECIFIER \*\* Delete the next paragraph if not required.

* + - 1. Solar Performance Properties: Film applied to 1/4 inch (6 mm) thick clear glass.
         1. Visible Light Transmission (ASTM E 903): 87 percent.
         2. Visible Reflection (ASTM E 903): Not more than 10 percent.
         3. Ultraviolet Transmission (ASTM E 903): Less than 1 percent.
         4. Solar Heat Gain Coefficient (ASTM E 903): 0.80

\*\* NOTE TO SPECIFIER \*\* Delete the next paragraph if not required.

* + - 1. Impact Resistance for Safety Glazing: Tested on 1/4 inch (6 mm) and 1/8 inch (3 mm) annealed glass.
         1. Safety Rating (CPSC 16 CFR, Part 1201): Category II (400 ft.-lbs).
         2. Safety Rating (ANSI Z97.1): Class A, Unlimited Size.

\*\* NOTE TO SPECIFIER \*\* Delete the next paragraph if not required.

* + - 1. Impact Resistance and Pressure Cycling: Film shall pass impact of Large Missile "C" and withstand subsequent pressure cycling (per ASTMs E1996 and E1886) at +/ 75 psf Design Pressure with use of 3M Impact Protection Attachment Sealant. Film applied to 1/4-inch tempered glass.

\*\* NOTE TO SPECIFIER \*\* IMPORTANT NOTICE: These products are not approved in the State of Florida for use as hurricane, windstorm, or impact protection from wind-borne debris from a hurricane or windstorm. In compliance with Florida Statute 553.842, these products may not be advertised, sold, offered, provided, distributed, or marketed in the State of Florida as hurricane, windstorm, or impact protection from wind-borne debris from a hurricane or windstorm.  
Impact Resistance and pressure cycling are performance based tests for Building Envelope Protection. Manufacturer shall provide 3rd party test reports showing the product complies with the impact and pressure cycling requirements of ASTMs E1886 / E1996.

* + - 1. Blast Hazard Mitigation:

\*\* NOTE TO SPECIFIER \*\* High explosive arena blast testing and shock tube testing are performance based methods for evaluating safety and security films for blast hazard mitigation. Manufacturer shall provide 3rd party test reports or a data sheet summary with specific reference to a 3rd party test report showing the product complies with the referenced standards. The data submittal shall indicate the blast load tested (blast pressure and impulse), film product tested, film attachment method, and performance rating achieved.

\*\* NOTE TO SPECIFIER \*\* Select one or more of the following paragraphs, based on glazing types relevant for the project and film attachment method desired. DELETE any paragraphs not required.

* + - * 1. GSA Rating of "2" / ASTM F1642 "No Hazard" with target blast pressure of 6 psi and 42 psi\*msec blast impulse, on 1/4 inch annealed single pane glass and 3M Impact Protection Attachment Sealant
        2. GSA Rating of "2" / ASTM F1642 "No Hazard" with target blast pressure of 6 psi and 42 psi\*msec blast impulse, on 1/4 inch tempered single pane glass with 3M Impact Protection Attachment Sealant
        3. GSA Rating of "2" / ASTM F1642 "No Hazard" with target blast pressure of 6 psi and 42 psi\*msec blast impulse, on 1 inch annealed double pane glass with 3M Impact Protection Attachment Sealant
        4. GSA Rating of "2" / ASTM F1642 "No Hazard" with target blast pressure of 9 psi and 60 psi\*msec blast impulse, on 1 inch annealed double pane glass with 3M Impact Protection Attachment Sealant
        5. GSA Rating of "2" / ASTM F1642 "No Hazard" with target blast pressure of 9 psi and 60 psi\*msec blast impulse, on 1 inch tempered double pane glass with 3M Impact Protection Attachment Sealant
        6. GSA Rating of "3a" / ASTM F1642 "Minimal Hazard" with target blast pressure of 6 psi and 42 psi\*msec blast impulse, on 1 inch tempered double pane glass with 3M Impact Protection Attachment Sealant (on 2 sides only)
        7. GSA Rating of "3b" with blast pressure of 9.4 psi and 55 psi\*msec blast impulse, on 1/4 inch annealed single pane glass and 3M Impact Protection Attachment Sealant
        8. GSA Rating of "2" with blast pressure of 7.8 psi and 55 psi\*msec blast impulse, on 1 inch tempered double pane glass with 3M Impact Protection Attachment Sealant
        9. GSA Rating of "3a" with blast pressure of 6 psi and 42 psi\*msec blast impulse, on 1/4 inch tempered single pane glass with 3M Impact Protection Attachment Sealant (on 2 sides only)

\*\* NOTE TO SPECIFIER \*\* Delete the entire next article if not required.

* 1. CLEAR SAFETY AND SECURITY WINDOW FILM

\*\* NOTE TO SPECIFIER \*\* Delete the next paragraph if Safety S40 (SH4CLARL) film is not required.

* + 1. 3M Safety S40 (SH4CLARL): Optically clear polyester film with a durable acrylic abrasion resistant coating over one surface and a pressure sensitive adhesive over the other. The adhesive is pressure-activated, not water-activated, and forms a physical bond, not chemical bond, to the glass.
       1. Physical / Mechanical Performance Properties:
          1. Film Color: Clear.
          2. Thickness: Nominal 4.0 mils.
          3. Tensile Strength (ASTM D 882): 25,000 psi.
          4. Elongation: 130 percent.
          5. Break Strength (ASTM D 882): 100 lbs/in.
       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.

\*\* NOTE TO SPECIFIER \*\* Delete the next paragraph if not required.

* + - 1. Solar Performance Properties: Film applied to 1/4 inch (6 mm) thick clear glass.
         1. Visible Light Transmission (ASTM E 903): 87 percent.
         2. Ultraviolet Transmission (ASTM E 903): Less than 1 percent.

\*\* NOTE TO SPECIFIER \*\* Delete the next paragraph if not required.

* + - 1. Impact Resistance for Safety Glazing: Tested on 1/4 inch (6 mm) and 1/8 inch (3 mm) annealed glass.
         1. Safety Rating (CPSC 16 CFR, Part 1201): Category I (150 ft.-lbs).
         2. Safety Rating (ANSI Z97.1): Class B, Unlimited Size.

\*\* NOTE TO SPECIFIER \*\* Delete the next paragraph if Safety S70 (SH7CLARL) film is not required.

* + 1. 3M Safety S70 (SH7CLARL): Optically clear polyester film with a durable acrylic abrasion resistant coating over one surface and a pressure sensitive adhesive over the other.
       1. Physical / Mechanical Performance Properties:
          1. Film Color: Clear.
          2. Thickness: Nominal 7.0 mils.
          3. Tensile Strength (ASTM D 882): 25,000 psi.
          4. Break Strength (ASTM D 882): 175 lbs/in.
       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.

\*\* NOTE TO SPECIFIER \*\* Delete the next paragraph if not required.

* + - 1. Solar Performance Properties: Film applied to 1/4 Inch (6 mm) thick clear glass.
         1. Visible Light Transmission (ASTM E 903): 87 percent.
         2. Ultraviolet Transmission (ASTM E 903): Less than 1 percent.

\*\* NOTE TO SPECIFIER \*\* Delete the next paragraph if not required.

* + - 1. Impact Resistance for Safety Glazing: Tested on 1/4 inch (6 mm) and 1/8 inch (3 mm) annealed glass.
         1. Safety Rating (CPSC 16 CFR, Part 1201): Category I (150 ft.-lbs).

\*\* NOTE TO SPECIFIER \*\* Delete the next paragraph if Safety S80 (SH8CLARL) film is not required.

* + 1. 3M Safety S80 (SH8CLARL): Optically clear polyester film with a durable acrylic abrasion resistant coating over one surface and a pressure sensitive adhesive over the other. The adhesive is pressure-activated, not water-activated, and forms a physical bond, not chemical bond, to the glass. The film may be laminated to other clear polyester film layers to achieve the desired thickness of the film.
       1. Physical / Mechanical Performance Properties:
          1. Film Color: Clear.
          2. Thickness: Nominal 8 mils.
          3. Tensile Strength (ASTM D 882): 25,000 psi.
          4. Break Strength (ASTM D 882): 200 lbs/in.
       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.

\*\* NOTE TO SPECIFIER \*\* Delete the next paragraph if not required.

* + - 1. Solar Performance Properties: Film applied to 1/4 Inch (6 mm) thick clear glass.
         1. Visible Light Transmission (ASTM E 903): 87 percent.
         2. Ultraviolet Transmission (ASTM E 903): Less than 1 percent.

\*\* NOTE TO SPECIFIER \*\* Delete the next paragraph if not required.

* + - 1. Impact Resistance for Safety Glazing: Tested on 1/4 inch (6 mm) and 1/8 inch (3 mm) annealed glass.
         1. Safety Rating (CPSC 16 CFR, Part 1201): Category II (400 ft.-lbs).
         2. Safety Rating (ANSI Z97.1): Class A, Unlimited Size.

\*\* NOTE TO SPECIFIER \*\* Contact 3M for specific test details. Delete the next paragraph if not required.

* + - 1. Blast Hazard Mitigation:
         1. GSA Rating of "3B" / ASTM F1642 "Minimal Hazard" with minimum blast load of 6 psi and 41 psi\*msec, on 1/4 inch (6 mm) single pane annealed glass and 3M Impact Protection Attachment Sealant film attachment system.
         2. GSA Rating of "3B" with minimum blast load of 4 psi and 29 psi\*msec, on 1/4 inch single pane annealed or tempered glass without use of film attachment system.

\*\* NOTE TO SPECIFIER \*\* Delete the next paragraph if Safety S140 (SH14CLARL) film is not required.

* + 1. 3M Safety S140 (SH14CLARL): Optically clear polyester film with a durable acrylic abrasion resistant coating over one surface and a pressure sensitive adhesive over the other. The adhesive is pressure-activated, not water-activated, and forms a physical bond, not chemical bond, to the glass. The film may be laminated to other clear polyester film layers to achieve the desired thickness of the film.
       1. Physical / Mechanical Performance Properties:
          1. Film Color: Clear.
          2. Thickness: Nominal 14 mils.
          3. Tensile Strength (ASTM D 882): 25,000 psi.
          4. Break Strength (ASTM D 882) (Per Inch Width): 350 lbs.
       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.

\*\* NOTE TO SPECIFIER \*\* Delete the next paragraph if not required.

* + - 1. Solar Performance Properties: Film applied to 1/4 Inch (6 mm) thick clear glass.
         1. Visible Light Transmission (ASTM E 903): 85 percent.
         2. Ultraviolet Transmission (ASTM E 903): Less than 1 percent.

\*\* NOTE TO SPECIFIER \*\* Delete the next paragraph if not required.

* + - 1. Impact Resistance for Safety Glazing: Tested on 1/4 inch (6 mm) and 1/8 inch (3 mm) annealed glass.
         1. Safety Rating (CPSC 16 CFR, Part 1201): Category II (400 ft.-lbs).

\*\* NOTE TO SPECIFIER \*\* Contact 3M for specific test details. Delete the next paragraph if not required.

* + - 1. Blast Hazard Mitigation: Independent testing with results from high explosive arena blast testing.
         1. GSA level 3B rating with minimum blast load of 15 psi overpressure and 58 psi\*msec blast impulse on 1 inch double pane annealed glass without use of film attachment system.

\*\* NOTE TO SPECIFIER \*\* Delete the next paragraph if not required.

* + - 1. Forced Entry Protection: Independent lab testing according to UL 972 protocol (Multiple Impact Test).
         1. Annealed Glass (1/4 inch) - Pass.
         2. Tempered Glass (1/4 inch) - Pass.

\*\* NOTE TO SPECIFIER \*\* Delete the entire next paragraph if Safety Exterior S20X if not required.

* + 1. 3M Safety Exterior S20X: Optically clear polyester film with an exterior durable abrasion resistant coating over one surface and a pressure sensitive adhesive over the other.
       1. Physical / Mechanical Performance Properties:
          1. Film Color: Clear.
          2. Thickness: Nominal 2 mils.
          3. Tensile Strength (ASTM D 882): 25,000 psi.
          4. Elongation: 88 percent.
          5. Break Strength (ASTM D 882): 50 lbs/in.
       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.

\*\* NOTE TO SPECIFIER \*\* Delete the next paragraph if not required.

* + - 1. Solar Performance Properties: Film applied to 1/4 Inch (6 mm) thick clear glass.
         1. Visible Light Transmission (ASTM E 903): 88 percent.
         2. Ultraviolet Transmission (ASTM E 903): Less than 0.5 percent.

\*\* NOTE TO SPECIFIER \*\* Delete the next paragraph if not required.

* + - 1. Impact Resistance for Safety Glazing: NA.

\*\* NOTE TO SPECIFIER \*\* Delete the next paragraph if Safety Exterior S40X film is not required.

* + 1. 3M Safety Exterior S40X. Optically clear polyester film with a durable acrylic abrasion resistant coating over one surface and a pressure sensitive adhesive over the other.
       1. Physical / Mechanical Performance Properties:
          1. Film Color: Clear.
          2. Thickness: Nominal 4 mils.
          3. Tensile Strength (ASTM D 882): 25,000 psi.
          4. Break Strength (ASTM D 882): 100 lbs/in.
       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.

\*\* NOTE TO SPECIFIER \*\* Delete the next paragraph if not required.

* + - 1. Solar Performance Properties: Film applied to 1/4 Inch (6 mm) thick clear glass.
         1. Visible Light Transmission (ASTM E 903): 89 percent.
         2. Ultraviolet Transmission (ASTM E 903): Less than 0.5 percent.

\*\* NOTE TO SPECIFIER \*\* Delete the next paragraph if not required.

* + - 1. Impact Resistance for Safety Glazing: Tested on 1/4 inch (6 mm) and 1/8 inch (3 mm) annealed glass.
         1. Safety Rating (CPSC 16 CFR, Part 1201): Category I (150 ft.-lbs).

\*\* NOTE TO SPECIFIER \*\* Delete the next paragraph if Safety Exterior S70X film is not required.

* + 1. 3M Safety Exterior S70X. Optically clear polyester film with a durable acrylic abrasion resistant coating over one surface and a pressure sensitive adhesive over the other.
       1. Physical / Mechanical Performance Properties:
          1. Film Color: Clear.
          2. Thickness: Nominal 7 mils.
          3. Tensile Strength (ASTM D 882): 25,000 psi.
          4. Break Strength (ASTM D 882): 140 lbs/in.
       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.

\*\* NOTE TO SPECIFIER \*\* Delete the next paragraph if not required.

* + - 1. Solar Performance Properties: Film applied to 1/4 Inch (6 mm) thick clear glass.
         1. Visible Light Transmission (ASTM E 903): 88 percent.
         2. Ultraviolet Transmission (ASTM E 903): Less than 0.5 percent.

\*\* NOTE TO SPECIFIER \*\* Delete the next paragraph if not required.

* + - 1. Impact Resistance for Safety Glazing: Tested on 1/4 inch (6 mm) and 1/8 inch (3 mm) annealed glass.
         1. Safety Rating (CPSC 16 CFR, Part 1201): Category I (150 ft.-lbs).

\*\* NOTE TO SPECIFIER \*\* Delete the entire next article if not required.

* 1. SAFETY AND SECURITY WINDOW FILM WITH SUN CONTROL
     1. 3M Safety Neutral S35. Dual reflective polyester film, nominally 8 mils (0.008 inch) thick, with a durable abrasion resistant coating over one surface and a pressure sensitive adhesive on the other. The film is comprised of an optically clear safety film laminated to a metallized film layer for reflective and sun control properties. The adhesive is pressure-activated, not water-activated, and forms a physical bond, not chemical bond, to the glass.
        1. Physical / Mechanical Performance Properties (nominal):

\*\* NOTE TO SPECIFIER \*\* While performance testing of film on glass is preferred approach for evaluating a safety film product, film tensile and mechanical properties are frequently specified. Where specified, indication shall be made as to product construction tested (with or without coatings) for fair comparison between products. Break, Tensile, and Elongation properties shall also be specified bi-directionally (MD / TD).

* + - * 1. Film Color: Neutral.
        2. Film Thickness (excluding coatings or adhesive liner): Nominal 8 mils.
        3. Tensile Strength 33,000 psi (MD) / 23,000 psi (TD).
        4. Break Strength: 170 lb/in (MD) / 280 lb/in (TD).
        5. Percent Elongation at Break: 100 percent (MD) / 80 percent (TD).
        6. Yield Strength: 23,000 psi.
        7. Percent Elongation at Yield: 80 percent.
      1. Uniformity: No noticeable pin holes, streaks, thin spots, scratches, banding or other optical defects.
      2. Variation in Total Transmission across the width: Less than 2 percent over the average at any portion along the length.
      3. Identification: Labeled as to Manufacturer as listed in this Section.
      4. Solar Performance Properties: Film applied to 1/4 inch (6 mm) thick clear glass (NFRC 100/200).
         1. Visible Light Transmission: 39 percent.
         2. Visible Reflection: 23 percent exterior / 13 percent interior.
         3. Ultraviolet Transmission: Not more than 1 percent.
         4. Solar Heat Gain Coefficient: 0.43.
      5. Impact Resistance for Safety Glazing: Tested on 1/4 inch (6 mm) annealed glass.
         1. Safety Rating (CPSC 16 CFR, Part 1201): Category 2 (400 ft.-lbs).
         2. Safety Rating (ANSI Z97.1): Class A, Unlimited (400 ft.-lbs).
    1. 3M Safety Silver S20. Highly reflective polyester film, nominally 8 mils (0.008") thick, with a durable abrasion resistant coating over one surface and a pressure sensitive adhesive on the other. The film is comprised of an optically clear safety film laminated to a metallized film layer for reflective and sun control properties. The adhesive is pressure-activated, not water-activated, and forms a physical bond, not chemical bond, to the glass.
       1. Physical / Mechanical Performance Properties (nominal):

\*\* NOTE TO SPECIFIER \*\* While performance testing of film on glass is preferred approach for evaluating a safety film product, film tensile and mechanical properties are frequently specified. Where specified, indication shall be made as to product construction tested (with or without coatings) for fair comparison between products. Break, Tensile, and Elongation properties shall also be specified bi-directionally (MD / TD).

* + - * 1. Film Color: Silver reflective.
        2. Film Thickness (excluding coatings or adhesive liner): Nominal 8 mils.
        3. Tensile Strength: 20,000 psi (MD) / 30,000 psi (TD).
        4. Break Strength: 160 lb/in (MD) / 247 lb/in (TD).
        5. Percent Elongation at Break: 95 percent (MD) / 76 percent (TD).
        6. Yield Strength: 15,000 psi.
        7. Percent Elongation at Yield: 7 percent.
      1. Uniformity: No noticeable pin holes, streaks, thin spots, scratches, banding or other optical defects.
      2. Variation in Total Transmission across the width: Less than 2 percent over the average at any portion along the length.
      3. Identification: Labeled as to Manufacturer as listed in this Section.
      4. Solar Performance Properties: Film applied to 1/4 inch (6 mm) thick clear glass (NFRC 100/200).
         1. Visible Light Transmission: 18 percent.
         2. Visible Reflection: 61 percent.
         3. Ultraviolet Transmission: Not more than 1 percent.
         4. Solar Heat Gain Coefficient: 0.25.
      5. Impact Resistance for Safety Glazing: Tested on 1/4 inch (6 mm) annealed glass.
         1. Safety Rating (CPSC 16 CFR, Part 1201): Category 2 (400 ft-lbs).
         2. Safety Rating (ANSI Z97.1): Class A, Unlimited (400 ft-lbs).

\*\* NOTE TO SPECIFIER \*\* IMPORTANT NOTICE: These products are not approved in the State of Florida for use as hurricane, windstorm, or impact protection from wind-borne debris from a hurricane or windstorm. In compliance with Florida Statute 553.842, these products may not be advertised, sold, offered, provided, distributed, or marketed in the State of Florida as hurricane, windstorm, or impact protection from wind-borne debris from a hurricane or windstorm.  
Impact Resistance and pressure cycling are performance based tests for Building Envelope Protection. Manufacturer shall provide 3rd party test reports showing the product complies with the impact and pressure cycling requirements of ASTMs E1886 / E1996. Contact 3M for specific test details.

\*\* NOTE TO SPECIFIER \*\* Delete the next paragraph if not required.

* + - 1. Impact Resistance and Pressure Cycling:
         1. Film shall pass impact of Small Missile "A" and withstand subsequent pressure cycling (per ASTMs E1996 and E1886) at +/- 60 psf Design Pressure with use of 3M Impact Protection Attachment Sealant attachment system. Tested on 1/4 inch (6 mm) tempered glass.
  1. ANTI-GRAFFITI WINDOW FILM

\*\* NOTE TO SPECIFIER \*\* Delete the next paragraph if AG-4 film is not required.

* + 1. 3M Anti-Graffiti 4 (AG-4): Optically clear polyester film with a durable acrylic abrasion resistant coating over one surface and a pressure sensitive adhesive over the other. The film may be laminated to other clear polyester film layers to achieve the desired thickness of the film.
       1. Physical / Mechanical Performance Properties:
          1. Film Color: Clear.
          2. Thickness: Nominal 4.0 mils.
          3. Tensile Strength (ASTM D 882): 25,000 psi.
          4. Break Strength (ASTM D 882) (Per Inch Width): 136 lbs.
          5. Elongation at Break (ASTM D 882): Greater than 100 percent.
          6. Peel Strength: 1 lbs/inch.
          7. Puncture Strength (ASTM D 4830): 90 lbs.
          8. Abrasion Resistance (ASTM D1044): Less than 2 percent increase in haze.
       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.

\*\* NOTE TO SPECIFIER \*\* Delete the next paragraph if not required.

* + - 1. Solar Performance Properties: Film applied to 1/4 Inch (6 mm) thick clear glass.
         1. Visible Light Transmission (ASTM E 903): 81 percent.
         2. Ultraviolet Transmission (ASTM E 903): Less than 1 percent.

\*\* NOTE TO SPECIFIER \*\* Delete the next paragraph if AG-6 film is not required.

* + 1. 3M Anti-Graffiti 6 (AG-6): Optically clear polyester film with a durable acrylic abrasion resistant coating over one surface and a pressure sensitive adhesive over the other. The film may be laminated to other clear polyester film layers to achieve the desired thickness of the film.
       1. Physical / Mechanical Performance Properties:
          1. Film Color: Clear.
          2. Thickness: Nominal 6.0 mils.
          3. Tensile Strength (ASTM D 882): 25,000 psi.
          4. Break Strength (ASTM D 882): 150 lbs/in.
          5. Elongation at Break (ASTM D 882): Greater than 100 percent.
          6. Peel Strength: 1 lbs/inch.
          7. Puncture Strength (ASTM D 4830): 125 lbs.
          8. Abrasion Resistance (ASTM D 1044): Less than 2 percent increase in haze.
       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.

\*\* NOTE TO SPECIFIER \*\* Delete the next paragraph if not required.

* + - 1. Solar Performance Properties: Film applied to 1/4 Inch (6 mm) thick clear glass.
         1. Visible Light Transmission (ASTM E 903): 87 percent.
         2. Ultraviolet Transmission (ASTM E 903): Less than 1 percent.
  1. 3M IMPACT PROTECTION FILM ATTACHMENT SYSTEMS

\*\* NOTE TO SPECIFIER \*\* Delete the next paragraph if 3M Impact Protection Adhesive is not required.

* + 1. 3M Impact Protection Attachment Sealant (IPA): Weatherable, UV-resistant, moisture curable structural sealant wet glaze.
       1. Color:

\*\* NOTE TO SPECIFIER \*\* Select one of the following paragraphs.

* + - * 1. Black.
        2. White.
      1. Material Properties (as supplied):
         1. Typical Cure Time: 3 - 7 days (25 degrees C, 50 percent RH).
         2. Full Adhesion: 7 - 14 days.
         3. Tack-Free Time (ASTM D 5895): 21 minutes (25 degrees C, 50 percent RH).
         4. Flow, Sag or Slump (ASTM D 2202): 0 inches.
         5. Specific Gravity: 1.4.
         6. Working Time: 10 - 20 minutes (25 degrees C, 50 percent RH).
         7. VOC Content: 16 g/L.
      2. Material Properties (as cured - 21 days at 25 degrees C, 50 percent RH):
         1. Ultimate Tensile Strength (ASTM D412): 380 psi (2.62 MPa).
         2. Ultimate Elongation (ASTM D412): 640 psi.
         3. Durometer Hardness, Shore A (ASTM D2240): 38-39 points.
         4. Tear Strength, Die B (ASTM D624): 72 ppi.
      3. Uniformity: Product shall have uniform consistency and appearance, with no clumping.

\*\* NOTE TO SPECIFIER \*\* Delete the next article if Combination Patterned Film is not required. Retain only films required from the included options.

* 1. COMBINATION PATTERNED FILM
     1. Fasara - Illumina Glace Decorative / Privacy Glazing Film:
        1. Ultraviolet Rejected (ASTM E 903): Not less than 99 percent.
        2. Visible Light Transmission (ASTM E 903, ASTM E 308): Not more than 49 percent.
        3. Visible Light Rejected (ASTM E 903): Not less than 19 percent.
        4. Solar Heat Reduction: Not less than 14 percent.
        5. Shading Coefficient at 90 Degrees (Normal Incidence) (ASTM E 903): Not less than 0.62.
     2. Fasara - Illumina Glace Decorative / Privacy Glazing Film:
        1. Ultraviolet Rejected (ASTM E 903): Not less than 99 percent.
        2. Visible Light Transmission (ASTM E 903, ASTM E 308): Not more than 63 percent.
        3. Visible Light Rejected (ASTM E 903): Not less than 13 percent.
        4. Solar Heat Reduction: Not less than 11 percent.
        5. Shading Coefficient at 90 Degrees (Normal Incidence) (ASTM E 903): Not less than 0.74.

\*\* NOTE TO SPECIFIER \*\* Delete the next article if Line Patterned Film is not required. Retain only films required from the included options.

* 1. LINE PATTERNED FILM
     1. Fasara - Fine Decorative / Privacy Glazing Film:
        1. Ultraviolet Rejected (ASTM E 903): Not less than 99 percent.
        2. Visible Light Transmission (ASTM E 903, ASTM E 308): Not more than 46 percent.
        3. Visible Light Rejected (ASTM E 903): Not less than 25 percent.
        4. Solar Heat Reduction: Not less than 19 percent.
        5. Shading Coefficient at 90 Degrees (Normal Incidence) (ASTM E 903): Not less than 0.62.
     2. Fasara - Lattice Glace Decorative / Privacy Glazing Film:
        1. Ultraviolet Rejected (ASTM E 903): Not less than 99 percent.
        2. Visible Light Transmission (ASTM E 903, ASTM E 308): Not more than 57 percent.
        3. Visible Light Rejected (ASTM E 903): Not less than 13 percent.
        4. Solar Heat Reduction: Not less than 11 percent.
        5. Shading Coefficient at 90 Degrees (Normal Incidence) (ASTM E 903): Not less than 0.71.
     3. Fasara - Slat Glace Decorative / Privacy Glazing Film:
        1. Ultraviolet Rejected (ASTM E 903): Not less than 99 percent.
        2. Visible Light Transmission (ASTM E 903, ASTM E 308): Not more than 53 percent.
        3. Visible Light Rejected (ASTM E 903): Not less than 15 percent.
        4. Solar Heat Reduction: Not less than 12 percent.
        5. Shading Coefficient at 90 Degrees (Normal Incidence) (ASTM E 903): Not less than 0.68.

\*\* NOTE TO SPECIFIER \*\* Delete the next article if Single Patterned Film is not required. Retain only films required from the included options.

* 1. SINGLE PATTERNED FILM
     1. Fasara - Mat Crystal I Decorative / Privacy Glazing Film:
        1. Ultraviolet Rejected (ASTM E 903): Not less than 99 percent.
        2. Visible Light Transmission (ASTM E 903, ASTM E 308): Not more than 83 percent.
        3. Visible Light Rejected (ASTM E 903): Not less than 8 percent.
        4. Solar Heat Reduction: Not less than 8 percent.
        5. Shading Coefficient at 90 Degrees (Normal Incidence) (ASTM E 903): Not less than 0.91.
     2. Fasara - Milky White Decorative / Privacy Glazing Film:
        1. Ultraviolet Rejected (ASTM E 903): Not less than 99 percent.
        2. Visible Light Transmission (ASTM E 903, ASTM E 308): Not more than 59 percent.
        3. Visible Light Rejected (ASTM E 903): Not less than 17 percent.
        4. Solar Heat Reduction: Not less than 21 percent.
        5. Shading Coefficient at 90 Degrees (Normal Incidence) (ASTM E 903): Not less than 0.75.
     3. Fasara - Milky Milky Decorative / Privacy Glazing Film:
        1. Ultraviolet Rejected (ASTM E 903): Not less than 99 percent.
        2. Visible Light Transmission (ASTM E 903, ASTM E 308): Not more than 28 percent.
        3. Visible Light Rejected (ASTM E 903): Not less than 27 percent.
        4. Solar Heat Reduction: Not less than 42 percent.
        5. Shading Coefficient at 90 Degrees (Normal Incidence) (ASTM E 903): Not less than 0.55.

\*\* NOTE TO SPECIFIER \*\* 3M FASARA Glass Finishes. Delete if not required.

* 1. ARCHITECTURAL FINISH FILMS
     1. Architectural Finish Films: 3M FASARA Glass Finishes Film as manufactured by 3M Company - Commercial Solutions.
     2. Material Properties:
        1. General: Glass and plastic finishes field-applied application to glass or plastic material as visual opaque or decorative film.
        2. Film: Polyester.
        3. Decorative Pattern: Printed.
        4. Adhesive: Acrylic, Pressure Sensitive, Permanent.
        5. Liner: Silicone-coated Polyester.
        6. Thickness (Average): 3.2 mils (80 microns).
        7. Fire Performance: Surface burning characteristics when tested in accordance with ASTM E84: Class A:
           1. Flame Spread: 25 maximum.
           2. Smoke Developed: 450 maximum.

\*\* NOTE TO SPECIFIER \*\* Delete any series and patterns not required.

* + 1. Optical Performance: Gradation Series.
       1. FASARA - Illumina Decorative / Privacy Glazing Film applied to 3mm thick clear glass (ASTM E 903, ASTM E 308):
          1. Ultraviolet Transmittance: 0.1 percent.
          2. Visible Light Transmittance: 51 percent.
          3. Visible Light Reflectance - Interior - Interior: 20 percent.
          4. Solar Heat Transmittance: 53 percent.
          5. Solar Heat Reflectance: 20 percent.
          6. Shading Coefficient at 90 Degrees (Normal Incidence): 0.72.
       2. FASARA - Illumina-g Decorative / Privacy Glazing Film applied to 3 mm thick clear glass (ASTM E 903, ASTM E 308):
          1. Ultraviolet Transmittance: 0.1 percent.
          2. Visible Light Transmittance: 66 percent.
          3. Visible Light Reflectance - Interior: 14 percent.
          4. Solar Heat Transmittance: 1 percent.
          5. Solar Heat Reflectance: 13 percent.
          6. Shading Coefficient at 90 Degrees (Normal Incidence): 0.83.
       3. FASARA - Illumina-P Decorative / Privacy Glazing Film applied to 3 mm thick clear glass (ASTM E 903, ASTM E 308):
          1. Ultraviolet Transmittance: 0.1 percent.
          2. Visible Light Transmittance: 66 percent.
          3. Visible Light Reflectance - Interior: 14 percent.
          4. Solar Heat Transmittance: 53 percent.
          5. Solar Heat Reflectance: 13 percent.
          6. Shading Coefficient at 90 Degrees (Normal Incidence): 0.83.
       4. FASARA - Illumina Silver Decorative / Privacy Glazing Film applied to 3 mm thick clear glass (ASTM E 903, ASTM E 308):
          1. Ultraviolet Transmittance: 0.1 percent.
          2. Visible Light Transmittance: 36 percent.
          3. Visible Light Reflectance - Interior: 59 percent.
          4. Solar Heat Transmittance: 33 percent.
          5. Solar Heat Reflectance: 50 percent.
          6. Shading Coefficient at 90 Degrees (Normal Incidence): 0.44.
       5. FASARA - Illumina Black Decorative / Privacy Glazing Film applied to 3 mm thick clear glass (ASTM E 903, ASTM E 308):
          1. Ultraviolet Transmittance: 0.1 percent.
          2. Visible Light Transmittance: 20 percent.
          3. Visible Light Reflectance - Interior: 6 percent.
          4. Solar Heat Transmittance: 19 percent.
          5. Solar Heat Reflectance: 6 percent.
          6. Shading Coefficient at 90 Degrees (Normal Incidence): 0.79.
       6. FASARA - Aerina Decorative / Privacy Glazing Film applied to 3 mm thick clear glass (ASTM E 903, ASTM E 308):
          1. Ultraviolet Transmittance: 0.1 percent.
          2. Visible Light Transmittance: 79 percent.
          3. Visible Light Reflectance - Interior: 13 percent.
          4. Solar Heat Transmittance: 76 percent.
          5. Solar Heat Reflectance: 12 percent.
          6. Shading Coefficient at 90 Degrees (Normal Incidence): 0.91.
       7. FASARA - Venetian Decorative / Privacy Glazing Film applied to 3 mm thick clear glass (ASTM E 903, ASTM E 308):
          1. Ultraviolet Transmittance: 0.1 percent.
          2. Visible Light Transmittance: 54 percent.
          3. Visible Light Reflectance - Interior: 23 percent.
          4. Solar Heat Transmittance: 55 percent.
          5. Solar Heat Reflectance: 18 percent.
          6. Shading Coefficient at 90 Degrees (Normal Incidence): 0.73.
       8. FASARA - Robe Decorative / Privacy Glazing Film applied to 3 mm thick clear glass (ASTM E 903, ASTM E 308):
          1. Ultraviolet Transmittance: 0.1 percent.
          2. Visible Light Transmittance: 35 percent.
          3. Visible Light Reflectance - Interior: 31 percent.
          4. Solar Heat Transmittance: 39 percent.
          5. Solar Heat Reflectance: 23 percent.
          6. Shading Coefficient at 90 Degrees (Normal Incidence): 0.59.
       9. FASARA - Lontano Decorative / Privacy Glazing Film applied to 3 mm thick clear glass (ASTM E 903, ASTM E 308):
          1. Ultraviolet Transmittance: 0.1 percent.
          2. Visible Light Transmittance: 61 percent.
          3. Visible Light Reflectance - Interior: 22 percent.
          4. Solar Heat Transmittance: 57 percent.
          5. Solar Heat Reflectance: 20 percent.
          6. Shading Coefficient at 90 Degrees (Normal Incidence): 0.74.
       10. FASARA - Sabrina Decorative / Privacy Glazing Film applied to 3 mm thick clear glass (ASTM E 903, ASTM E 308):
           1. Ultraviolet Transmittance: 0.1 percent.
           2. Visible Light Transmittance: 83 percent.
           3. Visible Light Reflectance - Interior: 10 percent.
           4. Solar Heat Transmittance: 77 percent.
           5. Solar Heat Reflectance: 9 percent.
           6. Shading Coefficient at 90 Degrees (Normal Incidence): 0.93.
       11. FASARA - Tsurugi Decorative / Privacy Glazing Film applied to 3 mm thick clear glass (ASTM E 903, ASTM E 308):
           1. Ultraviolet Transmittance: 0.1 percent.
           2. Visible Light Transmittance: 61 percent.
           3. Visible Light Reflectance - Interior: 21 percent.
           4. Solar Heat Transmittance: 58 percent.
           5. Solar Heat Reflectance: 19 percent.
           6. Shading Coefficient at 90 Degrees (Normal Incidence): 0.75.
    2. Optical Performance: Stripe Series.
       1. FASARA - Nokto Decorative / Privacy Glazing Film applied to 3 mm thick clear glass (ASTM E 903, ASTM E 308):
          1. Ultraviolet Transmittance: 0.1 percent.
          2. Visible Light Transmittance: 13 percent.
          3. Visible Light Reflectance - Interior: 7 percent.
          4. Solar Heat Transmittance: 12 percent.
          5. Solar Heat Reflectance: 7 percent.
          6. Shading Coefficient at 90 Degrees (Normal Incidence): 0.44.
       2. FASARA - Radius Decorative / Privacy Glazing Film applied to 3 mm thick clear glass (ASTM E 903, ASTM E 308):
          1. Ultraviolet Transmittance: 0.1 percent.
          2. Visible Light Transmittance: 6 percent.
          3. Visible Light Reflectance - Interior: 7 percent.
          4. Solar Heat Transmittance: 7 percent.
          5. Solar Heat Reflectance: 7 percent.
          6. Shading Coefficient at 90 Degrees (Normal Incidence): 0.40.
       3. FASARA - Shutie Decorative / Privacy Glazing Film applied to 3 mm thick clear glass (ASTM E 903, ASTM E 308):
          1. Ultraviolet Transmittance: 0.1 percent.
          2. Visible Light Transmittance: 59 percent.
          3. Visible Light Reflectance - Interior: 22 percent.
          4. Solar Heat Transmittance: 60 percent.
          5. Solar Heat Reflectance: 17 percent.
          6. Shading Coefficient at 90 Degrees (Normal Incidence): 0.77.
       4. FASARA - Shutie Black Decorative / Privacy Glazing Film applied to 3 mm thick clear glass (ASTM E 903, ASTM E 308):
          1. Ultraviolet Transmittance: 0.1 percent.
          2. Visible Light Transmittance: 51 percent.
          3. Visible Light Reflectance - Interior: 29 percent.
          4. Solar Heat Transmittance: 53 percent.
          5. Solar Heat Reflectance: 21 percent.
          6. Shading Coefficient at 90 Degrees (Normal Incidence): 0.70.
       5. FASARA - Arpa Decorative / Privacy Glazing Film applied to 3 mm thick clear glass (ASTM E 903, ASTM E 308):
          1. Ultraviolet Transmittance: 0.1 percent.
          2. Visible Light Transmittance: 67 percent.
          3. Visible Light Reflectance - Interior: 22 percent.
          4. Solar Heat Transmittance: 61 percent.
          5. Solar Heat Reflectance: 17 percent.
          6. Shading Coefficient at 90 Degrees (Normal Incidence): 0.78.
       6. FASARA - Arpa Black Decorative / Privacy Glazing Film applied to 3 mm thick clear glass (ASTM E 903, ASTM E 308):
          1. Ultraviolet Transmittance: 0.1 percent.
          2. Visible Light Transmittance: 22 percent.
          3. Visible Light Reflectance - Interior: 8 percent.
          4. Solar Heat Transmittance: 25 percent.
          5. Solar Heat Reflectance: 8 percent.
          6. Shading Coefficient at 90 Degrees (Normal Incidence): 0.54.
       7. FASARA - Seattle Decorative / Privacy Glazing Film applied to 3 mm thick clear glass (ASTM E 903, ASTM E 308):
          1. Ultraviolet Transmittance: 0.1 percent.
          2. Visible Light Transmittance: 74 percent.
          3. Visible Light Reflectance - Interior: 22 percent.
          4. Solar Heat Transmittance: 70 percent.
          5. Solar Heat Reflectance: 16 percent.
          6. Shading Coefficient at 90 Degrees (Normal Incidence): 0.85.
       8. FASARA - Seattle Fine Decorative / Privacy Glazing Film applied to 3 mm thick clear glass (ASTM E 903, ASTM E 308):
          1. Ultraviolet Transmittance: 0.1 percent.
          2. Visible Light Transmittance: 68 percent.
          3. Visible Light Reflectance - Interior: 25 percent.
          4. Solar Heat Transmittance: 71 percent.
          5. Solar Heat Reflectance: 16 percent.
          6. Shading Coefficient at 90 Degrees (Normal Incidence): 0.85.
       9. FASARA - Fine Decorative / Privacy Glazing Film applied to 3 mm thick clear glass (ASTM E 903, ASTM E 308):
          1. Ultraviolet Transmittance: 0.1 percent.
          2. Visible Light Transmittance: 48 percent.
          3. Visible Light Reflectance - Interior: 27 percent.
          4. Solar Heat Transmittance: 46 percent.
          5. Solar Heat Reflectance: 22 percent.
          6. Shading Coefficient at 90 Degrees (Normal Incidence): 0.65.
    3. Optical Performance: Border/Horizontal Series.
       1. FASARA - Lattice Decorative / Privacy Glazing Film applied to 3 mm thick clear glass (ASTM E 903, ASTM E 308):
          1. Ultraviolet Transmittance: 0.1 percent.
          2. Visible Light Transmittance: 36 percent.
          3. Visible Light Reflectance - Interior: 28 percent.
          4. Solar Heat Transmittance: 41 percent.
          5. Solar Heat Reflectance: 22 percent.
          6. Shading Coefficient at 90 Degrees (Normal Incidence): 0.60.
       2. FASARA - Lattice g Decorative / Privacy Glazing Film applied to 3 mm thick clear glass (ASTM E 903, ASTM E 308):
          1. Ultraviolet Transmittance: 0.1 percent.
          2. Visible Light Transmittance: 60 percent.
          3. Visible Light Reflectance - Interior: 14 percent.
          4. Solar Heat Transmittance: 62 percent.
          5. Solar Heat Reflectance: 13 percent.
          6. Shading Coefficient at 90 Degrees (Normal Incidence): 0.80.
       3. FASARA - Slat Decorative / Privacy Glazing Film applied to 3 mm thick clear glass (ASTM E 903, ASTM E 308):
          1. Ultraviolet Transmittance: 0.1 percent.
          2. Visible Light Transmittance: 36 percent.
          3. Visible Light Reflectance - Interior: 28 percent.
          4. Solar Heat Transmittance: 41 percent.
          5. Solar Heat Reflectance: 22 percent.
          6. Shading Coefficient at 90 Degrees (Normal Incidence): 0.60.
       4. FASARA - Slat g Decorative / Privacy Glazing Film applied to 3 mm thick clear glass (ASTM E 903, ASTM E 308):
          1. Ultraviolet Transmittance: 0.1 percent.
          2. Visible Light Transmittance: 56 percent.
          3. Visible Light Reflectance - Interior: 16 percent.
          4. Solar Heat Transmittance: 58 percent.
          5. Solar Heat Reflectance: 14 percent.
          6. Shading Coefficient at 90 Degrees (Normal Incidence): 0.77.
       5. FASARA - Pixela Decorative / Privacy Glazing Film applied to 3 mm thick clear glass (ASTM E 903, ASTM E 308):
          1. Ultraviolet Transmittance: 0.1 percent.
          2. Visible Light Transmittance: 60 percent.
          3. Visible Light Reflectance - Interior: 18 percent.
          4. Solar Heat Transmittance: 62 percent.
          5. Solar Heat Reflectance: 16 percent.
          6. Shading Coefficient at 90 Degrees (Normal Incidence): 0.78.
       6. FASARA - Paracell Decorative / Privacy Glazing Film applied to 3 mm thick clear glass (ASTM E 903, ASTM E 308):
          1. Ultraviolet Transmittance: 0.1 percent.
          2. Visible Light Transmittance: 50 percent.
          3. Visible Light Reflectance - Interior: 20 percent.
          4. Solar Heat Transmittance: 53 percent.
          5. Solar Heat Reflectance: 17 percent.
          6. Shading Coefficient at 90 Degrees (Normal Incidence): 0.71.
       7. FASARA - Leise Decorative / Privacy Glazing Film applied to 3 mm thick clear glass (ASTM E 903, ASTM E 308):
          1. Ultraviolet Transmittance: 0.1 percent.
          2. Visible Light Transmittance: 88 percent.
          3. Visible Light Reflectance - Interior: 9 percent.
          4. Solar Heat Transmittance: 81 percent.
          5. Solar Heat Reflectance: 9 percent.
          6. Shading Coefficient at 90 Degrees (Normal Incidence): 0.96.
    4. Optical Performance: Prism/Dot Series.
       1. FASARA - Prism Noir Decorative / Privacy Glazing Film applied to 3 mm thick clear glass (ASTM E 903, ASTM E 308):
          1. Ultraviolet Transmittance: 0.1 percent.
          2. Visible Light Transmittance: 42 percent.
          3. Visible Light Reflectance - Interior: 7 percent.
          4. Solar Heat Transmittance: 42 percent.
          5. Solar Heat Reflectance: 7 percent.
          6. Shading Coefficient at 90 Degrees (Normal Incidence): 0.67.
       2. FASARA - Prism Silver Decorative / Privacy Glazing Film applied to 3 mm thick clear glass (ASTM E 903, ASTM E 308):
          1. Ultraviolet Transmittance: 0.1 percent.
          2. Visible Light Transmittance: 53 percent.
          3. Visible Light Reflectance - Interior: 31 percent.
          4. Solar Heat Transmittance: 49 percent.
          5. Solar Heat Reflectance: 28 percent.
          6. Shading Coefficient at 90 Degrees (Normal Incidence): 0.64.
       3. FASARA - Astral Silver Decorative / Privacy Glazing Film applied to 3 mm thick clear glass (ASTM E 903, ASTM E 308):
          1. Ultraviolet Transmittance: 0.1 percent.
          2. Visible Light Transmittance: 30 percent.
          3. Visible Light Reflectance - Interior: 51 percent.
          4. Solar Heat Transmittance: 28 percent.
          5. Solar Heat Reflectance: 44 percent.
          6. Shading Coefficient at 90 Degrees (Normal Incidence): 0.42.
       4. FASARA - Cielo Decorative / Privacy Glazing Film applied to 3 mm thick clear glass (ASTM E 903, ASTM E 308):
          1. Ultraviolet Transmittance: 0.1 percent.
          2. Visible Light Transmittance: 56 percent.
          3. Visible Light Reflectance - Interior: 26 percent.
          4. Solar Heat Transmittance: 58 percent.
          5. Solar Heat Reflectance: 19 percent.
          6. Shading Coefficient at 90 Degrees (Normal Incidence): 0.74.
       5. FASARA - Luna 6 Decorative / Privacy Glazing Film applied to 3 mm thick clear glass (ASTM E 903, ASTM E 308):
          1. Ultraviolet Transmittance: 0.1 percent.
          2. Visible Light Transmittance: 46 percent.
          3. Visible Light Reflectance - Interior: 22 percent.
          4. Solar Heat Transmittance: 48 percent.
          5. Solar Heat Reflectance: 17 percent.
          6. Shading Coefficient at 90 Degrees (Normal Incidence): 0.68.
       6. FASARA - Luna 9 Decorative / Privacy Glazing Film applied to 3 mm thick clear glass (ASTM E 903, ASTM E 308):
          1. Ultraviolet Transmittance: 0.1 percent.
          2. Visible Light Transmittance: 39 percent.
          3. Visible Light Reflectance - Interior: 24 percent.
          4. Solar Heat Transmittance: 43 percent.
          5. Solar Heat Reflectance: 19 percent.
          6. Shading Coefficient at 90 Degrees (Normal Incidence): 0.63.
       7. FASARA - Aura 9 Decorative / Privacy Glazing Film applied to 3 mm thick clear glass (ASTM E 903, ASTM E 308):
          1. Ultraviolet Transmittance: 0.1 percent.
          2. Visible Light Transmittance: 87 percent.
          3. Visible Light Reflectance - Interior: 8 percent.
          4. Solar Heat Transmittance: 89 percent.
          5. Solar Heat Reflectance: 8 percent.
          6. Shading Coefficient at 90 Degrees (Normal Incidence): 0.96.
       8. FASARA - Vista Decorative / Privacy Glazing Film applied to 3 mm thick clear glass (ASTM E 903, ASTM E 308):
          1. Ultraviolet Transmittance: 0.1 percent.
          2. Visible Light Transmittance: 72 percent.
          3. Visible Light Reflectance - Interior: 17 percent.
          4. Solar Heat Transmittance: 67 percent.
          5. Solar Heat Reflectance: 15 percent.
          6. Shading Coefficient at 90 Degrees (Normal Incidence): 0.83.
       9. FASARA - SHIZUKU Decorative / Privacy Glazing Film applied to 3 mm thick clear glass (ASTM E 903, ASTM E 308):
          1. Ultraviolet Transmittance: 0.1 percent.
          2. Visible Light Transmittance: 71 percent.
          3. Visible Light Reflectance - Interior: 16 percent.
          4. Solar Heat Transmittance: 68 percent.
          5. Solar Heat Reflectance: 13 percent.
          6. Shading Coefficient at 90 Degrees (Normal Incidence): 0.84.
       10. FASARA - KANON Decorative / Privacy Glazing Film applied to 3 mm thick clear glass (ASTM E 903, ASTM E 308):
           1. Ultraviolet Transmittance: 0.1 percent.
           2. Visible Light Transmittance: 78 percent.
           3. Visible Light Reflectance - Interior: 14 percent.
           4. Solar Heat Transmittance: 73 percent.
           5. Solar Heat Reflectance: 13 percent.
           6. Shading Coefficient at 90 Degrees (Normal Incidence): 0.88.
    5. Optical Performance: Fabric/Japan Paper Series.
       1. FASARA - Linen Decorative / Privacy Glazing Film applied to 3 mm thick clear glass (ASTM E 903, ASTM E 308):
          1. Ultraviolet Transmittance: 0.1 percent.
          2. Visible Light Transmittance: 65 percent.
          3. Visible Light Reflectance - Interior: 23 percent.
          4. Solar Heat Transmittance: 73 percent.
          5. Solar Heat Reflectance: 17 percent.
          6. Shading Coefficient at 90 Degrees (Normal Incidence): 0.79.
       2. FASARA - Altair Decorative / Privacy Glazing Film applied to 3 mm thick clear glass (ASTM E 903, ASTM E 308):
          1. Ultraviolet Transmittance: 0.1 percent.
          2. Visible Light Transmittance: 60 percent.
          3. Visible Light Reflectance - Interior: 23 percent.
          4. Solar Heat Transmittance: 60 percent.
          5. Solar Heat Reflectance: 17 percent.
          6. Shading Coefficient at 90 Degrees (Normal Incidence): 0.77.
       3. FASARA - Vega Decorative / Privacy Glazing Film applied to 3 mm thick clear glass (ASTM E 903, ASTM E 308):
          1. Ultraviolet Transmittance: 0.1 percent.
          2. Visible Light Transmittance: 60 percent.
          3. Visible Light Reflectance - Interior: 21 percent.
          4. Solar Heat Transmittance: 60 percent.
          5. Solar Heat Reflectance: 16 percent.
          6. Shading Coefficient at 90 Degrees (Normal Incidence): 0.77.
       4. FASARA - SAGANO Decorative / Privacy Glazing Film applied to 3 mm thick clear glass (ASTM E 903, ASTM E 308):
          1. Ultraviolet Transmittance: 0.1 percent.
          2. Visible Light Transmittance: 68 percent.
          3. Visible Light Reflectance - Interior: 18 percent.
          4. Solar Heat Transmittance: 66 percent.
          5. Solar Heat Reflectance: 14 percent.
          6. Shading Coefficient at 90 Degrees (Normal Incidence): 0.83.
       5. FASARA - SAFU Decorative / Privacy Glazing Film applied to 3 mm thick clear glass (ASTM E 903, ASTM E 308):
          1. Ultraviolet Transmittance: 0.1 percent.
          2. Visible Light Transmittance: 54 percent.
          3. Visible Light Reflectance - Interior: 27 percent.
          4. Solar Heat Transmittance: 54 percent.
          5. Solar Heat Reflectance: 20 percent.
          6. Shading Coefficient at 90 Degrees (Normal Incidence): 0.72.
       6. FASARA - YAMATO Decorative / Privacy Glazing Film applied to 3 mm thick clear glass (ASTM E 903, ASTM E 308):
          1. Ultraviolet Transmittance: 0.1 percent.
          2. Visible Light Transmittance: 79 percent.
          3. Visible Light Reflectance - Interior: 15 percent.
          4. Solar Heat Transmittance: 74 percent.
          5. Solar Heat Reflectance: 12 percent.
          6. Shading Coefficient at 90 Degrees (Normal Incidence): 0.89.
       7. FASARA - KEN-UN Decorative / Privacy Glazing Film applied to 3 mm thick clear glass (ASTM E 903, ASTM E 308):
          1. Ultraviolet Transmittance: 0.1 percent.
          2. Visible Light Transmittance: 51 percent.
          3. Visible Light Reflectance - Interior: 28 percent.
          4. Solar Heat Transmittance: 54 percent.
          5. Solar Heat Reflectance: 21 percent.
          6. Shading Coefficient at 90 Degrees (Normal Incidence): 0.40.
       8. FASARA - RIKYU Decorative / Privacy Glazing Film applied to 3 mm thick clear glass (ASTM E 903, ASTM E 308):
          1. Ultraviolet Transmittance: 0.1 percent.
          2. Visible Light Transmittance: 72 percent.
          3. Visible Light Reflectance - Interior: 8 percent.
          4. Solar Heat Transmittance: 67 percent.
          5. Solar Heat Reflectance: 7 percent.
          6. Shading Coefficient at 90 Degrees (Normal Incidence): 0.86.
    6. Optical Performance: Frost/Matte and Mirror Series.
       1. FASARA - ESSEN Decorative / Privacy Glazing Film applied to 3 mm thick clear glass (ASTM E 903, ASTM E 308):
          1. Ultraviolet Transmittance: 0.1 percent.
          2. Visible Light Transmittance: 55 percent.
          3. Visible Light Reflectance - Interior: 26 percent.
          4. Solar Heat Transmittance: 50 percent.
          5. Solar Heat Reflectance: 23 percent.
          6. Shading Coefficient at 90 Degrees (Normal Incidence): 0.67.
       2. FASARA - LAUSANNE Decorative / Privacy Glazing Film applied to 3 mm thick clear glass (ASTM E 903, ASTM E 308):
          1. Ultraviolet Transmittance: 0.1 percent.
          2. Visible Light Transmittance: 84 percent.
          3. Visible Light Reflectance - Interior: 9 percent.
          4. Solar Heat Transmittance: 78 percent.
          5. Solar Heat Reflectance: 8 percent.
          6. Shading Coefficient at 90 Degrees (Normal Incidence): 0.94.
       3. FASARA - OSLO Decorative / Privacy Glazing Film applied to 3 mm thick clear glass (ASTM E 903, ASTM E 308):
          1. Ultraviolet Transmittance: 0.1 percent.
          2. Visible Light Transmittance: 83 percent.
          3. Visible Light Reflectance - Interior: 9 percent.
          4. Solar Heat Transmittance: 76 percent.
          5. Solar Heat Reflectance: 8 percent.
          6. Shading Coefficient at 90 Degrees (Normal Incidence): 0.92.
       4. FASARA - OSLO-P Decorative / Privacy Glazing Film applied to 3 mm thick clear glass (ASTM E 903, ASTM E 308):
          1. Ultraviolet Transmittance: 0.1 percent.
          2. Visible Light Transmittance: 83 percent.
          3. Visible Light Reflectance - Interior: 9 percent.
          4. Solar Heat Transmittance: 76 percent.
          5. Solar Heat Reflectance: 8 percent.
          6. Shading Coefficient at 90 Degrees (Normal Incidence): 0.92.
       5. FASARA - CHAMONIX Decorative / Privacy Glazing Film applied to 3 mm thick clear glass (ASTM E 903, ASTM E 308):
          1. Ultraviolet Transmittance: 0.1 percent.
          2. Visible Light Transmittance: 47 percent.
          3. Visible Light Reflectance - Interior: 35 percent.
          4. Solar Heat Transmittance: 51 percent.
          5. Solar Heat Reflectance: 26 percent.
          6. Shading Coefficient at 90 Degrees (Normal Incidence): 0.67.
       6. FASARA - Opaque White Decorative / Privacy Glazing Film applied to 3 mm thick clear glass (ASTM E 903, ASTM E 308):
          1. Ultraviolet Transmittance: 0.1 percent.
          2. Visible Light Transmittance: 10 percent.
          3. Visible Light Reflectance - Interior: 57 percent.
          4. Solar Heat Transmittance: 13 percent.
          5. Solar Heat Reflectance: 46 percent.
          6. Shading Coefficient at 90 Degrees (Normal Incidence): 0.30.
       7. FASARA - Fine Crystal Decorative / Privacy Glazing Film applied to 3 mm thick clear glass (ASTM E 903, ASTM E 308):
          1. Ultraviolet Transmittance: 0.1 percent.
          2. Visible Light Transmittance: 84 percent.
          3. Visible Light Reflectance - Interior: 9 percent.
          4. Solar Heat Transmittance: 78 percent.
          5. Solar Heat Reflectance: 8 percent.
          6. Shading Coefficient at 90 Degrees (Normal Incidence): 0.94.
       8. FASARA - Luce Decorative / Privacy Glazing Film applied to 3 mm thick clear glass (ASTM E 903, ASTM E 308):
          1. Ultraviolet Transmittance: 0.1 percent.
          2. Visible Light Transmittance: 34 percent.
          3. Visible Light Reflectance - Interior: 31 percent.
          4. Solar Heat Transmittance: 39 percent.
          5. Solar Heat Reflectance: 23 percent.
          6. Shading Coefficient at 90 Degrees (Normal Incidence): 0.59.
       9. FASARA - Mat Crystal-i Decorative / Privacy Glazing Film applied to 3 mm thick clear glass (ASTM E 903, ASTM E 308):
          1. Ultraviolet Transmittance: 0.1 percent.
          2. Visible Light Transmittance: 85 percent.
          3. Visible Light Reflectance - Interior: 9 percent.
          4. Solar Heat Transmittance: 78 percent.
          5. Solar Heat Reflectance: 8 percent.
          6. Shading Coefficient at 90 Degrees (Normal Incidence): 0.94.
       10. FASARA - Mat Crystal 2 Decorative / Privacy Glazing Film applied to 3 mm thick clear glass (ASTM E 903, ASTM E 308):
           1. Ultraviolet Transmittance: 0.1 percent.
           2. Visible Light Transmittance: 86 percent.
           3. Visible Light Reflectance - Interior: 8 percent.
           4. Solar Heat Transmittance: 79 percent.
           5. Solar Heat Reflectance: 7 percent.
           6. Shading Coefficient at 90 Degrees (Normal Incidence): 0.95.
       11. FASARA - Milky White (Milano) Decorative / Privacy Glazing Film applied to 3 mm thick clear glass (ASTM E 903, ASTM E 308):
           1. Ultraviolet Transmittance: 0.1 percent.
           2. Visible Light Transmittance: 59 percent.
           3. Visible Light Reflectance - Interior: 21 percent.
           4. Solar Heat Transmittance: 57 percent.
           5. Solar Heat Reflectance: 17 percent.
           6. Shading Coefficient at 90 Degrees (Normal Incidence): 0.75.
       12. FASARA - Milky Milky (San Marino) Decorative / Privacy Glazing Film applied to 3 mm thick clear glass (ASTM E 903, ASTM E 308):
           1. Ultraviolet Transmittance: 0.1 percent.
           2. Visible Light Transmittance: 21 percent.
           3. Visible Light Reflectance - Interior: 43 percent.
           4. Solar Heat Transmittance: 25 percent.
           5. Solar Heat Reflectance: 34 percent.
           6. Shading Coefficient at 90 Degrees (Normal Incidence): 0.44.
       13. FASARA - Glace Decorative / Privacy Glazing Film applied to 3 mm thick clear glass (ASTM E 903, ASTM E 308):
           1. Ultraviolet Transmittance: 0.1 percent.
           2. Visible Light Transmittance: 56 percent.
           3. Visible Light Reflectance - Interior: 18 percent.
           4. Solar Heat Transmittance: 58 percent.
           5. Solar Heat Reflectance: 14 percent.
           6. Shading Coefficient at 90 Degrees (Normal Incidence): 0.77.
       14. FASARA - Milky Crystal Decorative / Privacy Glazing Film applied to 3 mm thick clear glass (ASTM E 903, ASTM E 308):
           1. Ultraviolet Transmittance: 0.1 percent.
           2. Visible Light Transmittance: 19 percent.
           3. Visible Light Reflectance - Interior: 42 percent.
           4. Solar Heat Transmittance: 18 percent.
           5. Solar Heat Reflectance: 31 percent.
           6. Shading Coefficient at 90 Degrees (Normal Incidence): 0.40.
       15. FASARA - Mare Decorative / Privacy Glazing Film applied to 3 mm thick clear glass (ASTM E 903, ASTM E 308):
           1. Ultraviolet Transmittance: 0.1 percent.
           2. Visible Light Transmittance: 78 percent.
           3. Visible Light Reflectance - Interior: 10 percent.
           4. Solar Heat Transmittance: 74 percent.
           5. Solar Heat Reflectance: 9 percent.
           6. Shading Coefficient at 90 Degrees (Normal Incidence): 0.91.
       16. FASARA - Opaque Black Decorative / Privacy Glazing Film applied to 3 mm thick clear glass (ASTM E 903, ASTM E 308):
           1. Ultraviolet Transmittance: 0.1 percent.
           2. Visible Light Transmittance: 0.4 percent.
           3. Visible Light Reflectance - Interior: 5 percent.
           4. Solar Heat Transmittance: 1 percent.
           5. Solar Heat Reflectance: 5 percent.
           6. Shading Coefficient at 90 Degrees (Normal Incidence): 0.39.
       17. FASARA - Silver 1 Decorative / Privacy Glazing Film applied to 3 mm thick clear glass (ASTM E 903, ASTM E 308):
           1. Ultraviolet Transmittance: 71 percent.
           2. Visible Light Transmittance: 0 percent.
           3. Visible Light Reflectance - Interior: 91 percent.
           4. Solar Heat Transmittance: 0 percent.
           5. Solar Heat Reflectance: 78 percent.
           6. Shading Coefficient at 90 Degrees (Normal Incidence): 0.08.

\*\* NOTE TO SPECIFIER \*\* 3M CRYSTAL Glass Finishes. Delete if not required.

* 1. ARCHITECTURAL FINISH FILMS
     1. Architectural Finish Films: 3M CRYSTAL Glass Finishes as manufactured by 3M Company - Commercial Solutions.
     2. Material Properties:
        1. General: Glass finishes field-applied application to glass or plastic material as visual opaque or decorative film.
        2. Film: Vinyl.
        3. Option to Electrocut (by other than Manufacturer).
        4. Adhesive: Acrylic, Pressure Sensitive, Permanent.
        5. Liner: Silicone-coated Polyester.
        6. Thickness (Film and Adhesive without Liner):
           1. Dusted - 3.2 mils (81 microns).
           2. Frosted - 4.7 mils (120 microns).
        7. Fire Performance: Surface burning characteristics when tested in accordance with ASTM E84, Class A:
           1. Flame Spread: 25 maximum.
           2. Smoke Developed: 450 maximum.
     3. Optical Performance:
        1. CRYSTAL Dusted Decorative / Privacy Glazing Film:
           1. Ultraviolet Transmittance (ASTM E 903): 27 percent.
           2. Visible Light Transmittance (ASTM E 903, ASTM E308): 85 percent.
           3. Visible Light Reflectance (ASTM E 903): 79 percent.
           4. Solar Heat Transmittance: 76 percent.
           5. Solar Heat Reflectance: 7 percent.
           6. Shading Coefficient at 90 Degrees (Normal Incidence) (ASTM E 903): 0.93.
        2. CRYSTAL Frosted Decorative / Privacy Glazing Film:
           1. Ultraviolet Transmittance (ASTM E 903): 20 percent.
           2. Visible Light Transmittance (ASTM E 903, ASTM E308): 72 percent.
           3. Visible Light Reflectance (ASTM E 903): 12 percent.
           4. Solar Heat Transmittance: 64 percent.
           5. Solar Heat Reflectance: 10 percent.
           6. Shading Coefficient at 90 Degrees (Normal Incidence) (ASTM E 903): 0.82.

\*\* NOTE TO SPECIFIER \*\* 3M Decorative Polyester Glass Finish Film Glass Finishes. Delete if not required.

* 1. ARCHITECTURAL FINISH FILMS
     1. Architectural Finish Films: 3M Decorative Polyester Glass Finish Film as manufactured by 3M Company - Commercial Solutions.
     2. Material Properties:
        1. General: Glass finish field applied application to glass material as visual opaque or decorative film.
        2. Film: Polyester.
        3. Decorative Pattern: Custom-Printed per project (by other than Manufacturer).
        4. Adhesive: Acrylic, Pressure Sensitive, Permanent.
        5. Liner: Silicone-coated Polyester.
        6. Thickness (Film and Adhesive without Liner): 3 mils (76 microns).
        7. Fire Performance: Surface burning characteristics when tested in accordance with ASTM E84, Class A:
           1. Flame Spread: 25 maximum.
           2. Smoke Developed: 450 maximum.
     3. Optical Performance:
        1. Decorative Polyester Glass Finish Decorative Glazing Film applied to 3mm thick clear glass (ASTM E 903, ASTM E 308):
           1. Ultraviolet Transmittance: 0.1 percent.
           2. Visible Light Transmittance: 89 percent.
           3. Visible Light Reflectance: 10 percent.
           4. Solar Heat Transmittance: 81 percent.
           5. Solar Heat Reflectance: 9 percent.
           6. Shading Coefficient at 90 Degrees (Normal Incidence): 0.96.

\*\* NOTE TO SPECIFIER \*\* 3M DICHROIC DF-PA Film. Delete if not required.

* 1. ARCHITECTURAL FINISH FILMS
     1. Architectural Finish Films: 3M DICHROIC DF-PA Film as manufactured by 3M Company - Commercial Solutions.
     2. Material Properties:
        1. General: Glass finish field applied application to glass material as visual opaque or decorative graphic.
        2. Film: Multi-layer polymeric.
        3. Protective Layer: Hardcoated Polyester.

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

* + - 1. Base Film- Blaze:
         1. Transmissive Color: Cyan/Blue/Magenta.
         2. Reflective Color: Red/Gold.

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

* + - 1. Base Film- Chill:
         1. Transmissive Color: Blue/Magenta/Yellow.
         2. Reflective Color: Gold/Blue.
      2. Adhesive: Acrylic, Pressure Sensitive, Permanent.
      3. Liner: Silicone-coated Polyester.
      4. Thickness (Film and Adhesive without Liner):

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

* + - * 1. Blaze: 5.2 mils (132 microns).
        2. Chill: 5.0 mils (127 microns).
      1. Fire Performance: Surface burning characteristics when tested in accordance with ASTM E84: Class A:
         1. Flame Spread: 25 maximum.
         2. Smoke Developed: 450 maximum.
    1. Optical Performance:

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

* + - 1. Blaze Decorative Glazing Film applied to 3 mm thick clear glass (ASTM E 903, ASTM E 308):
         1. Ultraviolet Transmittance: 2.6 percent.
         2. Visible Light Transmittance: 77 percent.
         3. Visible Light Reflectance - Interior: 22 percent.
         4. Solar Heat Transmittance: 57 percent.
         5. Solar Heat Reflectance: 25 percent.
         6. Shading Coefficient at 90 Degrees (Normal Incidence): 0.70.
         7. Spectral Data (Left Band Edges): 590 nm.
         8. Spectral Data (Right Band Edges): 795 nm.

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

* + - 1. Chill Decorative Glazing Film applied to 3 mm thick clear glass (ASTM E 903, ASTM E 308):
         1. Ultraviolet Transmittance: 2.4 percent.
         2. Visible Light Transmittance: 17 percent.
         3. Visible Light Reflectance - Interior: 78 percent.
         4. Solar Heat Transmittance: 62 percent.
         5. Solar Heat Reflectance: 21 percent.
         6. Shading Coefficient at 90 Degrees (Normal Incidence): 0.77.
         7. Spectral Data (Left Band Edges): 500 nm.
         8. Spectral Data (Right Band Edges): 615 nm.

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.

\*\* NOTE TO SPECIFIER \*\* Delete the next paragraph if 3M Impact Protection Attachment Sealant is not required.

* + 1. Impact Protection Attachment Sealant Examination:
       1. If application of window film is/was the responsibility of another installer, notification in writing shall be made of deviations from manufacturer's recommended installation tolerances and conditions.
       2. Filmed glass surfaces receiving new attachment should first be examined to verify that they are free from defects and imperfections, and that the film edges extend sufficiently to the frame edges.
       3. Do not proceed with installation until film and frame 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.
       4. Upon the customer's request, an adhesion test to the frame surface may be conducted by applying a 4 - 6 inch long bead, approximately 0.5 - 1 inch in width, masking one side of the frame surface underneath the strip with tape. Allow the Impact Protection Adhesive to cure for 7 days and test adhesion by pulling up on the masked end and a 90 degree angle. If cohesive failure is observed (adhesive residue left behind on the frame surface), adhesion is acceptable; if adhesive failure is observed (clean peel from the frame), adhesion is unacceptable and product is not recommended.
  1. 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.
  2. 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.

\*\* NOTE TO SPECIFIER \*\* Delete the next paragraph if 3M Impact Protection Adhesive is not required.

* + 1. Impact Protection Attachment Sealant Installation:
       1. The film attachment system shall be applied according to the specifications of the Manufacturer by an Authorized Dealer/Applicator. Refer to 3M publication, 70-0709-0322-7, 3M Impact Protection Adhesive Attachment System Installation Instructions.
          1. For blast mitigation: minimum 1/2 inch bead overlap on both frame and film (excluding glazing stops or compression gaskets).
          2. For windborne debris protection: minimum 3/8 inch bead overlap on both frame and film (excluding glazing stops or compression gaskets).
       2. To ensure a straight and consistent bead width is achieved, masking tape may be applied to film and frame surfaces prior to application.
       3. With prior approval of the building owner or property manager, existing compression gaskets may be partially removed or trimmed to allow for a thinner bead and stronger anchorage. If removing the gaskets, sections shall be trimmed approximately 3 inches in length and inserted with appropriate spacing along all sides of the window to help secure the glazing during application and curing of the Impact Protection Adhesive.
       4. The Impact Protection Adhesive shall be dispensed with a caulk gun with nozzle opening diameter sized to match the approximate size of the desired bead width.
       5. A plastic putty knife or other tool with a clean straight edge shall be used to trowel and smooth out the adhesive. The completed adhesive bead shall be relatively triangular in shape.
       6. Any masking tape used shall be carefully removed within 10 minutes after applying the wet glaze.
  1. 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