



SECTION 08 87 13  
WINDOW FILM

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PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Safety and Security Window Film:
  - 1. Clear microlayered film. (Ultra S600) (Ultra S800)

1.2 RELATED SECTIONS

- A. Section 08 54 13 - Fiberglass Windows.
- B. Section 08 60 00 - Roof Windows and Skylights.
- C. Section 08 83 13 - Mirrored Glass Glazing.
- D. Section 08 44 23 - Structural Sealant Glazed Curtain Wall.

1.3 REFERENCES

- A. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test.
- B. ASHRAE - American Society for Heating, Refrigeration, and Air Conditioning Engineers; Handbook of Fundamentals.
- C. ASTM International (ASTM):
  - 1. ASTM D 882 - Standard Test Method for Tensile Properties of Thin Plastic Sheeting.
  - 2. ASTM D 1004 - Standard Test Method for Tear Resistance (Graves Tear) of Plastic Film and Sheeting.
  - 3. ASTM D 1044 - Standard Method of Test for Resistance of Transparent Plastics to Surface Abrasion (Taber Abrader Test).
  - 4. ASTM D 2582 - Standard Test Method for Puncture-Propagation Tear Resistance of Plastic Film and Thin Sheeting.
  - 5. ASTM D 4830 - Standard Test Methods for Characterizing Thermoplastic Fabrics Used in Roofing and Waterproofing.
  - 6. ASTM E 84 - Standard Method of Test for Surface Burning Characteristics of Building Materials.
  - 7. ASTM E 903 - Standard Methods of Test for Solar Absorbance, Reflectance and Transmittance of Materials Using Integrating Spheres.
  - 8. 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.
  - 9. ASTM E 1996 - Standard Specification for Performance of Exterior Windows, Curtain

Walls, Doors and Impact Protective Systems Impacted by Windborne Debris in Hurricanes.

10. ASTM F 1642 - Standard Method of Test for Glazing and Glazing Systems Subject to Airblast Loadings
  11. ASTM F 2912 - Standard Specification for Glazing and Glazing Systems Subject to Airblast Loadings.
- D. Consumer Products Safety Commission 16 CFR, Part 1201 - Safety Standard for Architectural Glazing Materials.
- E. GSA-TS01 - Standard Test for Glazing and Glazing Systems Subject to Airblast Loadings.
- F. NFRC 100/200 (Formerly ASTM E903) - Standard Methods of Test for Solar Absorbance, Reflectance and Transmittance of Materials Using Integrating Spheres.
- G. ISO 16933, International Standard for Glass in Building: Explosion-resistant security glazing - Test and classification for arena air-blast testing.

#### 1.4 PERFORMANCE REQUIREMENTS

- A. Safety Glazing Impact Performance:
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. Impact Resistance after Aging: 400 ft-lbs, meeting ANSI Z97.1 (Class A, Unlimited) and 16 CFR 1201 (Category 2) impact requirements with film applied on 1/8 inch annealed glass.
- B. Blast Hazard Mitigation Performance:
1. GSA Rating of "2" / ASTM F1642 "No Hazard" with minimum blast load of 7 psi and 43 psi\*msec, on 1/4 inch (6 mm) single pane glass and film attachment system.
  2. GSA Rating of "2" / ASTM F1642 "Minimal Hazard" with minimum blast load of 9 psi and 60 psi\*msec, on 1 inch (25 mm) double pane glass and film attachment system.
  3. GSA Rating of "3B" / ASTM F1642 "Very Low Hazard" with minimum blast load of 5 psi and 28 psi\*msec, on 1/4" single pane glass without film attachment system.
  4. GSA Rating of "3B" / ASTM F1642 "Low Hazard" with minimum blast load of 11 psi and 65 psi\*msec, on 1 inch (25 mm) double pane glass without film attachment system.
- C. Impact Resistance and Pressure Cycling:
1. ASTM E1996 / E1886: Small Missile "A", +/- 80 psf Design Pressure.
- D. Tear Resistance:
1. Minimum Graves Area Tear Strength of 1,000 lbs% as measured on coated film product, without liner, per ASTM D1004.
- E. Adhesion to Glass:
1. Minimum 8 lbs/in peel strength per ASTM D3330 (Method A).
- F. Flammability: Surface burning characteristics when tested in accordance ASTM E 84, demonstrating film applied to glass rated Class A for Interior Use:
1. Flame Spread Index: no greater than 25.
  2. Smoke Developed Index: no greater than 55.
- G. Abrasion Resistance:
1. Film shall have a surface coating that is resistant to abrasion such that less than 3 percent increase of transmitted light haze will result when tested in accordance to ASTM D 1044 using 100 cycles, 500 grams weight, and the CS10F Calibrase Wheel.

- H. UV Light Rejection:
  - 1. Minimum of 99.9% UV light rejection (300 - 380 nm), per ASTM E903, as determined with film applied on 1/4 inch clear glass.

## 1.5 SUBMITTALS

- A. Submit under provisions of Section 01 30 00 - Administrative Requirements.
- B. 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.
- C. 3rd Party Test Report Submittal Requirements. Submit the following 3rd Party test reports indicating compliance with the test values listed in this section.
  - 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.
  - 8. Impact Resistance and Pressure Cycling, ASTMs E1886 and E1996.
  - 9. Blast Hazard Mitigation Testing, ASTM F1642 / F2912 and/or GSA-TS01-2003.
- D. Other Product Submittals:
  - 1. Manufacturer's summary of 3rd Party Blast Hazard Mitigation Testing, ASTM F1642 / F2912 and/or GSA-TS01-2003
  - 2. 3rd Party test reports from Forced Entry Resistance evaluations.
- E. Verification Samples: For each film specified, two samples representing actual film color and pattern.

## 1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: All primary products specified in this section will be supplied by a single manufacturer with a minimum of ten years experience.
  - 1. Provide documentation that the adhesive used on the specified films is a Pressure Sensitive Adhesive (PSA).
- B. 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:
    - a. Name of building.
    - b. The name and telephone number of a management contact.
    - c. Type of glass.
    - d. Type of film and/or film attachment system.
    - e. Amount of film and/or film attachment system installed.
    - f. Date of completion.
- C. 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.

#### 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Follow Manufacturer's instructions for storage and handling.
- B. Store products in manufacturer's unopened packaging until ready for installation.
- C. Store and dispose of hazardous materials, and materials contaminated by hazardous materials, in accordance with requirements of local authorities having jurisdiction.

#### 1.8 PROJECT CONDITIONS

- A. 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.

#### 1.9 WARRANTY

- A. 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.

### PART 2 PRODUCTS

#### 2.1 MANUFACTURERS

- A. Acceptable Manufacturer: 3M Window Film, which is located at: 3M Center Bldg. 0235-02-S-27; St. Paul, MN 55144-1000; Toll Free Tel: 866-499-8857; Tel: 651-733-2222; Fax: 651-737-3446; Email: [request info \(jemannix@mmm.com\)](mailto:request info (jemannix@mmm.com)); Web: [www.3m.com/windowfilm](http://www.3m.com/windowfilm)
- B. Substitutions: Not permitted.

#### 2.2 CLEAR MICROLAYERED SAFETY AND SECURITY WINDOW FILM

- A. 3M Scotchshield Ultra S600 Safety and Security Window Film. Optically clear microlayered polyester film, nominally 6 mils (0.006 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):
    - a. Film Color: Clear.
    - b. Film Thickness (excluding coatings or adhesive liner): Nominal 6 mils
    - c. Tensile Strength (ASTM D882):
      - 1) Base Film: 32,000 psi (MD) / 32,000 psi (TD).
      - 2) Coated Film: 27,000 psi (MD) / 27,000 psi (TD).
    - d. Break Strength (ASTM D882):
      - 1) Base Film: 190 lb/in (MD) / 190 lb/in (TD).
      - 2) Coated Film: 160 lb/in (MD) / 160 lb/in (TD).
    - e. Percent Elongation at Break (ASTM D882):
      - 1) Base Film: 110 % (MD) / 100 % (TD).
      - 2) Coated Film: 85 % (MD) / 95 % (TD).
    - f. Yield Strength:

- 1) Base Film: 12,000 psi (MD).
- 2) Coated Film: 15,000 psi (MD).
- g. Percent Elongation at Yield (ASTM D882):
  - 1) Base Film: 7% (MD).
  - 2) Coated Film: 8% (MD).
- h. Graves Tear Resistance (ASTM D1004):
  - 1) Maximum Force (lbs):
    - a) Base Film: 28 (MD) / 28 (TD).
    - b) Coated Film: 28 (MD) / 28 (TD).
  - 2) Maximum Extension (in):
    - a) Base Film: 0.45 (MD) / 0.65 (TD).
    - b) Coated Film: 0.55 (MD) / 0.55 (TD).
  - 3) Graves Area Tear Resistance (lbs%):
    - a) Base Film: 900 (MD) / 1,200 (TD).
    - b) Coated Film: 900 (MD) / 1,100 (TD).
- i. Puncture Propagation Tear Resistance (ASTM D2582):
  - 1) Coated Film: 6 lbf (MD) / 7 lbf (TD).
- j. Puncture Strength (ASTM D4830):
  - 1) Coated Film: 140 lbf.
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.
5. Solar Performance Properties: Film applied to 1/4 inch (6 mm) thick clear glass.
  - a. Visible Light Transmission (ASTM E 903): 87 percent.
  - b. Ultraviolet Transmission (ASTM E 903): Less than 0.5 percent.
6. Impact Resistance for Safety Glazing: Tested on 1/4 inch (6 mm) annealed glass.
  - a. Safety Rating (CPSC 16 CFR, Part 1201): Category II (400 ft.-lbs).
  - b. Safety Rating (ANSI Z97.1): Class A, Unlimited Size.
7. Impact Resistance and Pressure Cycling: Film shall pass impact of Small Missile "A" and withstand subsequent pressure cycling (per ASTMs E 1996 and E 1886) at +/- 80 psf Design Pressure with use of 3M Impact Protection Adhesive. Film applied to 3/16 inch (4.8 mm) tempered glass.
8. Blast Hazard Mitigation:
  - a. GSA Rating of "2" / ASTM F1642 "Minimal Hazard" with blast pressure of 7 psi and 44 psi\*msec blast impulse, on 1/4 inch (6 mm) annealed single pane glass and 3M Impact Protection Profile Attachment system.
  - b. GSA Rating of "2" / ASTM F1642 "Minimal Hazard" with blast pressure of 7 psi and 42 psi\*msec blast impulse, on 1/4 inch (6 mm) tempered single pane glass and 3M Impact Protection Profile Attachment system
  - c. GSA Rating of "2" / ASTM F1642 "Minimal Hazard" with blast pressure of 7 psi and 42 psi\*msec blast impulse, on 1/4 inch (6 mm) annealed single pane glass and 3M Impact Protection Adhesive Attachment system
  - d. GSA Rating of "2" / ASTM F1642 "Minimal Hazard" with blast pressure of 7 psi and 42 psi\*msec blast impulse, on 1/4 inch (6 mm) tempered single pane glass and 3M Impact Protection Adhesive Attachment system
  - e. GSA Rating of "2" / ASTM F1642 "Minimal Hazard" with blast pressure of 8 psi and 60 psi\*msec blast impulse, on 1 inch (25.4 mm) annealed double pane glass and 3M Impact Protection Profile Attachment system
  - f. GSA Rating of "2" / ASTM F1642 "Minimal Hazard" with blast pressure of 8 psi and 60 psi\*msec blast impulse, on 1 inch (25.4 mm) annealed double pane glass and 3M Impact Protection Adhesive Attachment system
  - g. GSA Rating of "3B" / ASTM F1642 "Very Low Hazard" with blast pressure of 4 psi and 28 psi\*msec blast impulse, on 1/4 inch (6 mm) annealed single pane glass, daylight applied film (no attachment)

- h. GSA Rating of "3B" / ASTM F1642 "Low Hazard" with blast pressure of 7 psi and 43 psi\*msec blast impulse, on 1/4 inch (6 mm) tempered single pane glass, daylight applied film (no attachment)
  - i. GSA Rating of "3B" / ASTM F1642 "Low Hazard" with blast pressure of 7 psi and 42 psi\*msec blast impulse, on 1 inch (25.4 mm) annealed double pane glass, daylight applied film (no attachment)
  - j. GSA Rating of "3B" / ASTM F1642 "Low Hazard" with blast pressure of 12 psi and 70 psi\*msec blast impulse, on 1 inch (25.4 mm) tempered double pane glass, daylight applied film (no attachment)
9. Forced Entry Resistance: Product shall have been evaluated for time to resist complete body passage by a qualified 3rd Party test lab.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. 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.
    - a. 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.

### 3.2 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- C. Refer to Manufacturer's installation instructions for methods of preparation for Impact Protection Adhesive or Impact Protection Profile film attachment systems.

### 3.3 INSTALLATION

- A. 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.

### 3.4 CLEANING AND PROTECTION

- A. Remove left over material and debris from Work area. Use necessary means to protect film before, during, and after installation.
- B. Touch-up, repair or replace damaged products before Substantial Completion.
- C. 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