SECTION 08870

SPECIFICATION FOR 3M SAFETY AND SECURITY WINDOW FILM SYSTEM

**** NOTE TO SPECIFIER ** 3M Window Film**

This section is based on the products of 3M Window Film, which is located at:
3M Center Bldg. 0235.
St. Paul, MN 55144-1000.
Toll Free: 800-480-1704
Tel: 651-733-2222.
Web: www.3m.com/windowfilm.

This specification is for a glass shatter resistant safety and security window film system. When applied to the interior glass surface, the system helps hold broken glass together and provides a deterrent against aggressive forced entry by an intruder attempting to enter a building through glass doors or windows. This specification is intended primarily for municipal buildings or educational institutions where the existing glazing in windows and doors are vulnerable and offer little resistance to entry. Application of the Safety and Security Film Window System provides an increased measure of protection by slowing down and potentially drawing attention to an intruder's efforts to gain access through the glazing, thereby providing building occupants more time to respond. Degree of protection or penetration time is variable, unpredictable, and depends on numerous factors. This Safety and Security Film System is NOT BULLET PROOF or BULLET-RESISTANT; however, when applied according to this specification it may provide glass shatter resistance when shot at with a firearm.

The Safety and Security Window Film System comprises a glass shatter resistant window film and film attachment system to secure the filmed glass to the window frame. The film is 6 mils (0.006") thick and made of 42 microlayers which imparts tear resistance designed to limit the ability to expand an opening through broken glass large enough to enable body passage. The film shall be called 3M™ Ultra S600 Safety and Security Window Film.

The attachment system is a modified structural silicone sealant with low volatile organic compound (VOC) content, low odor, and fast cure time. It forms a strong bond between the film and window frame that is tamper resistant. Effective anchorage with the film attachment system limits the ability of the intruder to dislodge the filmed glass panel from the framing system, instead forcing the intruder to create an opening through filmed broken glass to gain entry. The film attachment shall be called 3M™ Impact Protection Adhesive.

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Safety and security films.

B. Film Attachment Systems.

1.2 RELATED SECTIONS

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

A. Section 08500 - Windows; windows to receive safety and security window film.

B. Section 08800 - Glazing; general glazing applications to receive safety and security window film.

C. Section 08900 - Glazed Curtain Walls; curtain walls to receive safety and security window film.

1.3 REFERENCES

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

A. ASHRAE - American Society for Heating, Refrigeration, and Air Conditioning Engineers; Handbook of Fundamentals.

B. ASTM International (ASTM):
1. ASTM D 624 - Standard Test Method of Test for Tear Strength of Conventional Vulcanized Rubber ad Thermoplastic Elastomers.
2. ASTM D 882 - Standard Test Method for Tensile Properties of Thin Plastic Sheeting.
3. ASTM D 1004 - Standard Test Method for Tear Resistance (Graves Tear) of Plastic Film and Sheeting.
4. ASTM D 1044 - Standard Method of Test for Resistance of Transparent Plastics to Surface Abrasion (Taber Abrader Test).
5. ASTM D 2240 – Standard Test Method for Rubber Property – Durometer Hardness.
6. ASTM D 2582 - Standard Test Method for Puncture-Propagation Tear Resistance of Plastic Film and Thin Sheeting.
7. ASTM D 4830 - Standard Test Methods for Characterizing Thermoplastic Fabrics Used in Roofing and Waterproofing.
8. ASTM D 5895 - Standard Test Methods for Evaluating Drying or Curing During Film Formation of Organic Coatings Using Mechanical Recorders.
9. ASTM E 84 - Standard Method of Test for Surface Burning Characteristics of Building Materials.
10. ASTM E 308 - Standard Recommended Practice for Spectophotometry and Description of Color in CIE 1931 System.
11. ASTM E 330 – Standard Test Method for Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure
12. ASTM E 903 - Standard Methods of Test for Solar Absorbance, Reflectance and Transmittance of Materials Using Integrating Spheres.
13. ASTM E 1886 - Standard Test Method for Performance of Exterior Windows, Curtain Walls, Doors, and Impact Protective Systems Impacted by Missile(s) and Exposed to Cyclic Pressure Differentials.
14. ASTM E 1996 - Standard Specification for Performance of Exterior Windows, Curtain Walls, Doors and Impact Protective Systems Impacted by Windborne

Debris in Hurricanes. ASTM D 412 - Standard Test Methods for Vulcanized Rubber ad Thermoplastic Elastomers – Tension.

15. ASTM F 1642 Standard Test Method for Glazing and Glazing Systems Subject to Airblast Loadings
16. ASTM G 26 - Standard Practice for Performing Accelerated Outdoor Weatherizing for Non-metallic Materials Using Concentrated Natural Sunlight.

C. Window 5.2 - A Computer Tool for Analyzing Window Thermal Performance; Lawrence Berkeley Laboratory.

D. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test.

E. Consumer Products Safety Commission 16 CFR, Part 1201 - Safety Standard for Architectural Glazing Materials.

F. GSA Standard Test for Glazing and Glazing Systems Subject to Airblast Loadings.

G. ISO 16933, International Standard for Glass in Building: Explosion-resistant security glazing - Test and classification for arena air-blast testing.

H. Underwriters Laboratories Inc. (UL): UL 972 - Burglary Resisting Glazing Material.

1.4 PERFORMANCE REQUIREMENTS

A. Fire Performance: Surface burning characteristics when tested in accordance ASTM E 84:
1. Flame Spread: 25, maximum.
2. Smoke Developed: 450, maximum.

B. Abrasion Resistance: Film must have a surface coating that is resistant to abrasion such that, less than 5 percent increase of transmitted light haze will result in accordance with ASTM D 1044 using 50 cycles, 500 grams weight, and the CS10F Calbrase Wheel.

1.5 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
1. Preparation instructions and recommendations.
2. Storage and handling requirements and recommendations.
3. Installation methods.

C. Performance Submittals: Provide 3rd party test reports or other documentation for relevant safety and security glazing performance testing

**** NOTE TO SPECIFIER ** Delete selection samples if colors have already been selected.**

D. Selection Samples: For each film specified, submit film samples representing manufacturer's film type for the project.

E. Verification Samples: For each film specified, two samples representing 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.

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.

NOTE TO SPECIFIER ** Insert number of properties required.

   2. Provide a commercial building reference list of __ properties where the installer has applied safety and security window film systems. This list will include the following information:
      a. Name of building.
      b. The name and telephone number of a management contact.
      c. Type of film and film attachment system.
      d. Amount of film installed (sqft) and film attachment system installed (lineal feet).
      e. Date of completion.

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

   3. Provide a Glass Stress Analysis of the existing glass and proposed glass/film combination as recommended by the film manufacturer.
   4. Provide an 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.**

C. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
   1. Finish areas designated by the specifying authority.
   2. Do not proceed with remaining work until workmanship, color, and sheen are approved by the specifying authority.
   3. Refinish mock-up area as required to produce acceptable work.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. 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 absolute 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: 800-480-1704; Tel: 651-733-2222; Fax: 651-737-3446; Web: www.3m.com/windowfilm

B. Requests for substitutions will be considered in accordance with provisions of Section 01600.

2.2 CLEAR MICROLAYERED SAFETY AND SECURITY WINDOW FILM

A. Glazing shall be filmed with an optically clear microlayered polyester film, 3M Ultra S600 Safety and Security Window Film. The film shall contain at least forty-two microlayers and have a durable acrylic abrasion resistant coating on one surface and a pressure sensitive adhesive on the other.
   1. Physical / Mechanical Performance Properties:
      a. Film Color: Clear.
      b. Thickness: Nominal 6.0 mils (0.15 mm), comprised of 42 micro-layers.
      c. Tensile Strength (ÅSTM D 882): 30,000 psi.
      d. Break Strength (ÅSTM D 882) (Per Inch Width): 180 lbs.
      e. Tear Resistance (ASTM D 1004): Greater than 1,150 lbs.
      f. Puncture Propagation Tear (ASTM D 2582): 19.2 lbs.
      g. Young's Modulus (ASTM D 882): 500 kpsi nominal.
   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 (6.4 mm) thick clear glass.
      a. Visible Light Transmission (ÅSTM E 903): 84 percent.
      b. Visible Reflection (ÅSTM E 903): Not more than 10 percent.
      c. Ultraviolet Transmission (ÅSTM E 903): Less than 1 percent.
      d. Solar Heat Gain Coefficient (ÅSTM E 903): 0.78.
   6. Impact Resistance for Safety Glazing: Tested on 1/4 inch (6.4 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. Windstorm Protection: Film shall pass impact of Medium Large Missile "C" and withstand subsequent pressure cycling (per ASTMs E 1996 and E 1886) at 50 psf Design Pressure with use of 3M Impact Protection Adhesive or 3M Impact Protection Profile attachment system.
   8. Bomb Blast Mitigation: Independent testing with results from high explosive arena blast testing.
      a. GSA Rating with minimum blast pressure and impulse of 14 psi and 60 psi*msec, respectively: “2” (No Hazard / Very High Protection).
      b. GSA Rating with minimum blast pressure and impulse of 10 psi and 89 psi*msec, respectively: “3B” (Low Hazard / High Protection).
      c. ASTM F1642 Rating with minimum blast pressure and impulse of 10 psi and 89 psi*msec, respectively: “Minimal Hazard”.

2.3 Film Attachment System

A. Glazing with applied safety and security film shall be attached to the window frame with a structural modified silicone wet glaze sealant, 3M Impact Protection Adhesive. The sealant shall be a weatherable UV resistant polymer, and moisture curable. It shall exhibit low VOC content, low odor and fast cure time.
   1. Properties, as supplied
      a. Color (select one)

**** NOTE TO SPECIFIER ** Choose color. Delete 1 of the following 2 sections.**

1) Black
2) White

b. Typical Cure Time: 3 – 7 days (25°C, 50% RH)
c. Full Adhesion: 7 – 14 days
d. Tack-Free Time (ASTM D 5895): 21 minutes (25°C, 50% RH)
e. Flow, Sag or Slump (ASTM D 2202): 0 inches
f. Specific Gravity: 1.4
g. Working Time: 10 – 20 minutes (25°C, 50% RH)
h. VOC Content: 16 g/L

2. Properties, as cured (21 days at 25°C, 50% RH)
   a. Ultimate Tensile Strength (ASTM D412): 380 psi (2.62 MPa)
   b. Ultimate Elongation (ASTM D412): 640 psi
   c. Durometer Hardness, Shore A (ASTM D2240): 38-39 points
   d. Tear Strength, Die B (ASTM D624): 72 ppi
3. Uniformity: Product shall have uniform consistency and appearance, with no clumping.
4. Identification: Labeled as to Manufacturer as listed in this Section.

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

5. Windstorm Protection:
   a. As part of a filmed glass system, film attachment shall demonstrate ability to withstand Medium Large Missile C and Small Missile A impact, with subsequent pressure cycling (per ASTMs E 1996 and E 1886) at +/- 70 psf design pressure.
   b. As part of a filmed glass system, film attachment shall demonstrate ability withstand structural load requirements of ASTM E330 when tested at +/ 120 psf design pressure.

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

6. Bomb Blast Mitigation: Independent testing with results from high explosive arena blast testing.
   a. GSA Rating with minimum blast pressure and impulse of 4 psi and 28 psi*msec, respectively: “2” (No Hazard / Very High Protection).
   b. GSA Rating with minimum blast pressure and impulse of 11 psi and 55 psi*msec, respectively: “2” (No Hazard / Very High Protection).
   c. GSA Rating with minimum blast pressure and impulse of 10 psi and 89 psi*msec, respectively: “3B” (Low Hazard / High Protection).
7. ASTM F 1642 Rating with nominal blast pressure and impulse of 8 psi and 42 psi*msec, respectively: “ Very Low Hazard”

PART 3 EXECUTION

3.1 EXAMINATION

A. Some glazing framing systems are not suitable for wet glaze safety and security film attachments. Contact 3M for recommended alternatives.

B. If preparation of glass surfaces is the responsibility of another installer, notify specifying authority 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. Filmed glass surfaces receiving new attachment should first be examined to verify that they are free from defects and imperfections, sufficiently dry, and that

the film edges are within 1/8” from the frame edges.

C. 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.

D. At the request of the specifying authority, 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

E. 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. Installer shall take necessary precautions to protect interior furnishings.

3.3 FILM INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. 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.

C. 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.

D. Apply film to glass and lightly spray film with slip solution.

E. Squeegee from top to bottom of window. Spray slip solution to film and squeegee a second time.

F. Bump film edge with lint-free towel wrapped around edge of a 5-way tool.

G. 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.

3.4 FILM ATTACHMENT SYSTEM INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Minimum bead overlap shall be 3/8” on the film surface; and minimum ¼” overlap on frame surface (excluding glazing stops or compression gaskets). Recommended bead overlap on frame surface is minimum 3/8”, but may not be possible due to project site factors.

C. To ensure a straight and consistent bead width is achieved, masking tape may be applied to film and frame surfaces before application of 3M Impact Protection Adhesive.

D. With prior approval of the building owner, property manager, or specifying authority, existing compression gaskets may be partially removed or trimmed to allow for a thinner bead. If removing the gaskets, trim sections approximately 3 inches in length and insert with appropriate spacing along all sides of the window to help secure the glazing during application and curing of the Impact Protection Adhesive.

E. Dispense Impact Protection Adhesive with a caulk gun and nozzle having an opening cut to approximate size of desired bead width.

F. Use a plastic putty knife to trowel and smooth out the adhesive. The trowel shall have a straight edge to create a triangular shaped bead with a smooth, flat surface. The finished adhesive bead shall be triangular in shape and not substantially concave.

G. Carefully remove any masking tape within 10 minutes of application before the Impact Protection Adhesive begins to form a hard skin.

3.5 CLEANING AND PROTECTION

A. Remove left over material and debris from Work area. Use necessary means to protect film and attachment system before, during, and after installation.

B. Touch-up, repair or replace damaged products before Substantial Completion.

C. Immediately remove any uncured excess film attachment sealant on film or frame using a disposable cloth or paper towel wet with isopropyl alcohol.

D. Impact Protection Attachment shall be allowed to cure for at least 3 to 7 days. Use necessary means to protect after installation.

E. 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

See legal disclaimer and pertinent information following