SECTION 08873
SAFETY AND SECURITY WINDOW FILM

PART 1 GENERAL

1.1 SECTION INCLUDES
A. Safety and security film.

1.2 RELATED SECTIONS
A. Section 08500 - Windows: Windows to receive solar control film.
B. Section 08600 - Skylights: Glass Skylights to receive solar control film.
C. Section 08800 - Glazing: General Glazing applications to receive solar control film.
D. Section 08900 - Glazed Curtain Walls: Curtain Walls to receive solar control film.

1.3 REFERENCES
B. ASTM D 1044 - Standard Method of Test for Resistance of Transparent Plastics to Surface Abrasion (Taber Abrader Test).
D. ASTM E 308 - Standard Recommended Practice for Spectrophotometry and Description of Color in CIE 1931 System.
Architectural Glazing Materials


M. ASTM E 1886 (2005) - 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

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


1.4 PERFORMANCE REQUIREMENTS

A. Flammability: Surface burning characteristics when tested in accordance ASTM E 84:
   1. Flame Spread Index: 25, maximum.
   2. Smoke Developed Index: 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. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.

D. Verification Samples: For each finish product specified, two samples representing actual product, color, and patterns.

E. Performance Submittals:
   1. Provide laboratory data of emissivity and calculated window U-Factors for various outdoor temperatures based upon established calculation procedure defined by the 1997 ASHRAE Handbook of Fundamentals, Chapter 29, or Lawrence Berkeley Laboratory Window 5.2 Computer Program.

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 (10) years experience.

B. Installer Qualifications: All products listed in this section are to be installed by a single installer with a minimum of five (5) years demonstrated experience in installing products of the same type and scope as specified.
   1. Provide documentation that the installer is authorized by the Manufacturer to perform Work specified in this section.
2. Provide a commercial building reference list of ____ (#) 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.
   e. Amount of film installed.
   f. Date of completion.
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.

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. 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: 888-364-3577; Web: www.3m.com/windowfilm
B. Substitutions: Not permitted.
C. Requests for substitutions will be considered in accordance with provisions of Section 01600.

2.2 CLEAR MICROLAYERED SAFETY AND SECURITY WINDOW FILM
A. 3M Ultra™ Safety and Security Window Films: Optically clear micro-layered polyester film, with a durable acrylic abrasion resistant coating over one surface and a pressure sensitive adhesive on the other. The film is clear and will not contain dyed polyester.
   1. Film Type: Ultra S150.
   2. Film Type: Ultra S400.
3. Film Type: Ultra S600.
4. Uniformity: No noticeable pin holes, streaks, thin spots, scratches, banding or other optical defects.
5. Variation in Total Transmission across the Width: Less than 2 percent over the average at any portion along the length.
6. Identification: Labeled as to Manufacturer as listed in this Section.

B. Performance, 3M™ Ultra S150 Safety and Security Window Film:
1. Physical / Mechanical Performance Properties:
   a. Film Color: Clear.
   b. Thickness: Nominal 2.0 mils (0.05 mm).
   c. Tensile Strength (ASTM D 882): 30,000 psi.
   d. Break Strength (ASTM D 882) (Per Inch Width): 60 lbs.
   g. Young’s Modulus (ASTM D 882): 500 kpsi nominal.
2. Solar Performance Properties -- film applied to 1/4 Inch (6.4 mm) thick clear glass:
   b. Visible Reflection (ASTM E 903): Not more than 11 percent.
   c. Ultraviolet Transmission (ASTM E 903): Less than 1 percent.
   d. Solar Heat Gain Coefficient (ASTM E 903): 0.82.
3. Impact Resistance for Safety Glazing (tested on 1/4" annealed glass):

C. Performance, 3M™ Ultra S400 Safety and Security Window Film:
1. Physical / Mechanical Performance Properties:
   a. Film Color: Clear.
   b. Thickness: Nominal 4.0 mils (0.1 mm).
   c. Tensile Strength (ASTM D 882): 30,000 psi.
   e. Tear Resistance (ASTM D 1004): Greater than 780 lbs.
   g. Young’s Modulus (ASTM D 882): 500 kpsi nominal.
2. Solar Performance Properties -- film applied to 1/4 Inch (6.4 mm) thick clear glass:
   b. Visible Reflection (ASTM E 903): Not more than 11 percent.
   c. Ultraviolet Transmission (ASTM E 903): Less than 1 percent.
   d. Solar Heat Gain Coefficient (ASTM E 903): 0.79.
3. Impact Resistance for Safety Glazing (tested on 1/4" annealed glass):
4. Windstorm Protection:
   a. Film shall pass impact of Medium Large Missile “C” and withstand subsequent pressure cycling (per ASTM E1996 and E1886) at 70 psf Design Pressure with use of 3M™ Impact Protection Adhesive attachment system.
   b. Film shall pass impact of Small Missile “A” and withstand subsequent pressure cycling (per ASTM E1996 and E1886) at 50 psf Design Pressure with use of 3M™ Impact Protection Adhesive attachment system.
5. 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 (GSA blast level “C”): 3B.

D. Performance, 3M™ Ultra S600 Safety and Security Window Film:
1. Physical / Mechanical Performance Properties:
a. Film Color: Clear.
b. Thickness: Nominal 6.0 mils (0.15 mm).
c. Tensile Strength (ASTM D 882): 30,000 psi.
e. Tear Resistance (ASTM D 1004): Greater than 1,150 lbs.
g. Young’s Modulus (ASTM D 882): 500 kpsi nominal.

2. Solar Performance Properties -- film applied to 1/4 Inch (6.4 mm) thick clear glass:
   b. Visible Reflection (ASTM E 903): Not more than 10 percent.
   c. Ultraviolet Transmission (ASTM E 903): Less than 1 percent.
   d. Solar Heat Gain Coefficient (ASTM E 903): 0.78.

3. Impact Resistance for Safety Glazing (tested on ¼” clear annealed glass):

4. Windstorm Protection: Film shall pass impact of Medium Large Missile “C” and withstand subsequent pressure cycling (per ASTMs E1996 and E1886) at 50 psf Design Pressure with use of 3M™ Impact Protection Adhesive or 3M™ Impact Protection Profile attachment system.

5. 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 (GSA blast level “C”): 3B.
   b. GSA Rating with minimum blast pressure and impulse of 11 psi and 55 psi.msec, respectively (ISO 16933 blast level “EXV-25”): 3A.
   c. GSA Rating with minimum blast pressure and impulse of 10 psi and 89 psi.msec, respectively (GSA blast level “D”): 3B.

2.3 MICROLAYERED SAFETY AND SECURITY WINDOW FILM WITH SUN CONTROL

A. 3M Ultra™ Prestige Safety and Security Window Films with Sun Control: Optically clear, micro-layered, polyester film laminated to different clear multi-layered polyester film containing at least 220 layers with a pressure sensitive adhesive on one side and durable acrylic abrasion resistant coating on the other side. Films contain no metals, but so contain infrared-absorbing carbon, metal oxide particles, or both.
   1. Film Type: Ultra PR S70.
   2. Film Type: Ultra PR S50.
   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. Identification: Labeled as to Manufacturer as listed in this Section.

B. Performance, 3M™ Ultra Prestige PR S70 Safety and Security Window Film with Sun Control:
   1. Physical / Mechanical Performance Properties:
      a. Film Color: Clear with at least 220 layers.
      b. Thickness: Nominal 6.0 mils (0.15 mm).
      c. Tensile Strength (ASTM D 882): 30,000 psi.
      e. Tear Resistance (ASTM D 1004): Greater than 780 lbs.
      g. Young’s Modulus (ASTM D 882): 500 kpsi nominal.
   2. Solar Performance Properties -- film applied to 1/4 Inch (6.4 mm) thick clear glass:
      b. Visible Reflection (ASTM E 903): Not more than 10 percent.
c. Ultraviolet Transmission (ASTM E 903): Less than 1 percent.
d. Solar Heat Gain Coefficient (ASTM E 903): 0.50.
e. TSER - 60 Degree Angle - 59 percent.

3. Impact Resistance for Safety Glazing (tested on ¼” annealed glass):

4. Windstorm Protection:
   a. Film shall pass impact of Medium Large Missile “C” and withstand
      subsequent pressure cycling (per ASTM E1996 and E1886) at 70 psf Design
      Pressure with use of 3M™ Impact Protection Adhesive attachment system.
   b. Film shall pass impact of Small Missile “A” and withstand subsequent
      pressure cycling (per ASTM E1996 and E1886) at 50 psf Design Pressure with use
      of 3M™ Impact Protection Adhesive attachment system.

5. 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 (GSA blast level “C”): 3B.
   b. GSA Rating with minimum blast pressure and impulse of 7 psi and 36
      psi.msec, respectively (ISO 16933 blast level “EXV-33”): 2.

6. GSA Rating with minimum blast pressure and impulse of 7 psi and 36
   psi.msec, respectively (ISO 16933 blast level “EXV-33”): 2.

C. Performance, 3M™ Ultra Prestige PR S50 Safety and Security Window Film with Sun
   Control:
   1. Physical / Mechanical Performance Properties:
      a. Film Color: Clear with at least 220 layers.
      b. Thickness: Nominal 6.0 mils (0.15 mm).
      c. Tensile Strength (ASTM D 882): 30,000 psi.
      e. Tear Resistance (ASTM D 1004): Greater than 780 lbs.
      g. Young’s Modulus (ASTM D 882): 500 kpsi nominal.
   2. Solar Performance Properties -- film applied to 1/4 Inch (6.4 mm) thick clear glass:
      b. Visible Reflection (ASTM E 903): Not more than 8 percent.
      c. Ultraviolet Transmission (ASTM E 903): Less than 1 percent.
      d. Solar Heat Gain Coefficient (ASTM E 903): 0.44.
      e. TSER - 60 Degree Angle - 63 percent.
   3. Impact Resistance for Safety Glazing (tested on ¼” annealed glass):
   4. Windstorm Protection:
      a. Film shall pass impact of Medium Large Missile “C” and withstand
         subsequent pressure cycling (per ASTM E1996 and E1886) at 70 psf Design
         Pressure with use of 3M™ Impact Protection Adhesive attachment system.
      b. Film shall pass impact of Small Missile “A” and withstand subsequent
         pressure cycling (per ASTM E1996 and E1886) at 50 psf Design Pressure with use
         of 3M™ Impact Protection Adhesive attachment system.
   5. 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 (GSA blast level “C”): 3B.
       6. GSA Rating with minimum blast pressure and impulse of 7 psi and 36
          psi.msec, respectively (ISO 16933 blast level “EXV-33”): 2.

D. 3M Ultra™ Safety and Security Window Films with Sun Control: Optically clear multi-layered
    polyester film laminated to a metalized polyester film, with a durable abrasion resistant coating
over one surface and a pressure sensitive adhesive on the other. The film color is derived from the metal coating and the product will not contain dyed polyester.

1. Film Type: Ultra Silver S20.
2. Film Type: Ultra Neutral S35.
3. Film Type: Ultra Neutral S50.
4. Film Type: Ultra NV S25.

E. Performance, 3M™ Ultra Silver S20 Safety and Security Window Film with Sun Control:

1. Physical / Mechanical Performance Properties:
   a. Film Color: Tinted - Derived from metal coatings.
   b. Thickness: Nominal 6.0 mils (0.15 mm).
   c. Tensile Strength (ASTM D 882): 30,000 psi.
   e. Tear Resistance (ASTM D 1004): Greater than 780 lbs.
   g. Young's Modulus (ASTM D 882): 500 kpsi nominal.

2. Solar Performance Properties -- film applied to 1/4 Inch (6.4 mm) thick clear glass:
   b. Visible Reflection (ASTM E 903): Not more than 58 percent.
   c. Ultraviolet Transmission (ASTM E 903): Less than 1 percent.

3. Impact Resistance for Safety Glazing (tested on ¼” annealed glass):

4. Windstorm Protection:
   a. Film shall pass impact of Medium Large Missile “C” and withstand subsequent pressure cycling (per ASTM E1996 and E1886) at 70 psf Design Pressure with use of 3M™ Impact Protection Adhesive attachment system.

5. 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 (GSA blast level “C”): 3B.

F. Performance, 3M™ Ultra Neutral S35 Safety and Security Window Film with Sun Control:

1. Physical / Mechanical Performance Properties:
   a. Film Color: Tinted - Derived from metal coatings.
   b. Thickness: Nominal 6.0 mils (0.15 mm).
   c. Tensile Strength (ASTM D 882): 30,000 psi.
   e. Tear Resistance (ASTM D 1004): Greater than 780 lbs.
   g. Young’s Modulus (ASTM D 882): 500 kpsi nominal.

2. Solar Performance Properties -- film applied to 1/4 Inch (6.4 mm) thick clear glass:
   b. Visible Reflection (ASTM E 903): Not more than 20 percent.
   c. Ultraviolet Transmission (ASTM E 903): Less than 1 percent.
   d. Solar Heat Gain Coefficient (ASTM E 903): 0.44.

3. Impact Resistance for Safety Glazing (tested on ¼” annealed glass):

4. Windstorm Protection:
   a. Film shall pass impact of Medium Large Missile “C” and withstand subsequent pressure cycling (per ASTM E1996 and E1886) at 70 psf Design
Pressure with use of 3M™ Impact Protection Adhesive attachment system.
b. Film shall pass impact of Small Missile “A” and withstand subsequent pressure cycling (per ASTMs E1996 and E1886) at 50 psf Design Pressure with use of 3M™ Impact Protection Adhesive attachment system.

5. 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 (GSA blast level “C”): 3B.

G. Performance, 3M™ Ultra Neutral S50 Safety and Security Window Film with Sun Control:
1. Physical / Mechanical Performance Properties:
a. Film Color: Tinted - Derived from metal coatings.
b. Thickness: Nominal 6.0 mils (0.15 mm).
c. Tensile Strength (ASTM D 882): 30,000 psi.
e. Tear Resistance (ASTM D 1004): Greater than 780 lbs.
g. Young’s Modulus (ASTM D 882): 500 kpsi nominal.

2. Solar Performance Properties -- film applied to 1/4 Inch (6.4 mm) thick clear glass:
b. Visible Reflection (ASTM E 903): Not more than 15 percent.
c. Ultraviolet Transmission (ASTM E 903): Less than 1 percent.
d. Solar Heat Gain Coefficient (ASTM E 903): 0.56.

3. Impact Resistance for Safety Glazing (tested on ¼” annealed glass):

4. Windstorm Protection:
a. Film shall pass impact of Medium Large Missile “C” and withstand subsequent pressure cycling (per ASTMs E1996 and E1886) at 70 psf Design Pressure with use of 3M™ Impact Protection Adhesive attachment system.
b. Film shall pass impact of Small Missile “A” and withstand subsequent pressure cycling (per ASTMs E1996 and E1886) at 50 psf Design Pressure with use of 3M™ Impact Protection Adhesive attachment system.

5. 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 (GSA blast level “C”): 3B.

H. Performance, 3M™ Ultra Night Vision S25 Safety and Security Window Film with Solar Control:
1. Physical / Mechanical Performance Properties:
a. Film Color: Tinted - Derived from metal coatings.
b. Thickness: Nominal 6.0 mils (0.15 mm).
c. Tensile Strength (ASTM D 882): 30,000 psi.
e. Tear Resistance (ASTM D 1004): Greater than 780 lbs.
g. Young’s Modulus (ASTM D 882): 500 kpsi nominal.

2. Solar Performance Properties -- film applied to 1/4 Inch (6.4 mm) thick clear glass:
b. Visible Reflection (ASTM E 903): Not more than 28 percent.
c. Ultraviolet Transmission (ASTM E 903): Less than 1 percent.

3. Impact Resistance for Safety Glazing (tested on ¼” annealed glass):
4. Windstorm Protection:
   a. Film shall pass impact of Medium Large Missile “C” and withstand subsequent pressure cycling (per ASTM E1996 and E1886) at 70 psf Design Pressure with use of 3M™ Impact Protection Adhesive attachment system.
   b. Film shall pass impact of Small Missile “A” and withstand subsequent pressure cycling (per ASTMs E1996 and E1886) at 50 psf Design Pressure with use of 3M™ Impact Protection Adhesive attachment system.

5. 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 (GSA blast level “C”): 3B.

2.4 CLEAR SAFETY AND SECURITY WINDOW FILM

A. 3M Safety and Security Window Film: 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. Film Type: Safety S40.
   2. Film Type: Safety S70.
   3. Film Type: Safety S80
   4. Film Type: Safety S140
   5. Uniformity: No noticeable pin holes, streaks, thin spots, scratches, banding or other optical defects.
   6. Variation in Total Transmission across the Width: Less than 2 percent over the average at any portion along the length.
   7. Identification: Labeled as to Manufacturer as listed in this Section.

B. Performance, 3M™ Safety S40 (SH4CLARL) Safety and Security Window Film:
   1. Physical / Mechanical Performance Properties:
      a. Film Color: Clear.
      b. Thickness: Nominal 4.0 mils (0.10 mm).
      c. Tensile Strength (ASTM D 882): 25,000 psi.
      d. Elongation: 130 percent.
      e. Break Strength (ASTM D 882) (Per Inch Width): 175 lbs.
   2. Solar Performance Properties -- film applied to 1/4 Inch (6.4 mm) thick clear glass:
      b. Visible Reflection (ASTM E 903): Not more than 10 percent.
      c. Ultraviolet Transmission (ASTM E 903): Less than 1 percent.
      d. Solar Heat Gain Coefficient (ASTM E 903): 0.82.
   3. Impact Resistance for Safety Glazing (tested on ¼” annealed glass):

C. Performance, 3M™ Safety S70 (SH7CLARL) Safety and Security Window Film:
   1. Physical / Mechanical Performance Properties:
      a. Film Color: Clear.
      b. Thickness: Nominal 7.0 mils (0.18 mm).
      c. Tensile Strength (ASTM D 882): 25,000 psi.
   2. Solar Performance Properties -- film applied to 1/4 Inch (6.4 mm) thick clear glass:
      b. Visible Reflection (ASTM E 903): Not more than 10 percent.
      c. Ultraviolet Transmission (ASTM E 903): Less than 1 percent.
      d. Solar Heat Gain Coefficient (ASTM E 903): 0.79.
   3. Impact Resistance for Safety Glazing (tested on ¼” annealed glass):

4. 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 (GSA blast level “C”): 3B.
   b. GSA Rating with minimum blast pressure and impulse of 10 psi and 89 psi.msec, respectively (GSA blast level “D”): 3B.

D. Performance, 3M™ Safety S80 (SH8CLARL) Safety and Security Window Film:
   1. Physical / Mechanical Performance Properties:
      a. Film Color: Clear.
      b. Thickness: Nominal 8.0 mils (0.20 mm).
      c. Tensile Strength (ASTM D 882): 25,000 psi.
   2. Solar Performance Properties -- film applied to 1/4 Inch (6.4 mm) thick clear glass:
      b. Visible Reflection (ASTM E 903): Not more than 10 percent.
      c. Ultraviolet Transmission (ASTM E 903): Less than 1 percent.
      d. Solar Heat Gain Coefficient (ASTM E 903): 0.79.
   3. Impact Resistance for Safety Glazing (tested on ¼” annealed glass):
   4. 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 (GSA blast level “C”): 3B (daylight).
      b. GSA Rating with minimum blast pressure and impulse of 7 psi and 36 psi.msec, respectively (ISO 16933 blast level “EXV-33”): 2.
      c. GSA Rating with minimum blast pressure and impulse of 11 psi and 55 psi.msec, respectively (ISO 16933 blast level “EXV-25”): 2.

E. Performance, 3M™ Safety S140 (SH14CLARL) Safety and Security Window Film:
   1. Physical / Mechanical Performance Properties:
      a. Film Color: Clear.
      b. Thickness: Nominal 14.0 mils (0.36 mm).
      c. Tensile Strength (ASTM D 882): 25,000 psi.
   2. Solar Performance Properties -- film applied to 1/4 Inch (6.4 mm) thick clear glass:
      b. Visible Reflection (ASTM E 903): Not more than 10 percent.
      c. Ultraviolet Transmission (ASTM E 903): Less than 1 percent.
      d. Solar Heat Gain Coefficient (ASTM E 903): 0.78.
   3. Impact Resistance for Safety Glazing (tested on ¼” annealed glass):
   4. Windstorm Protection
      a. Film shall pass impact of Medium Large Missile “C” and withstand subsequent pressure cycling (per ASTMs E1996 and E1886) at 50 psf Design Pressure with use of 3M™ Impact Protection Adhesive attachment system.
   5. Bomb Blast Mitigation: Independent testing with results from high explosive arena blast testing:
      a. GSA Rating with minimum blast pressure and impulse of 7 psi and 36 psi.msec, respectively (ISO 16933 blast level “EXV-33”): 3B.
      b. GSA Rating with minimum blast pressure and impulse of 11 psi and 55 psi.msec, respectively (ISO 16933 blast level “EXV-25”): 3B.
2.5 SAFETY AND SECURITY WINDOW FILM WITH SUN CONTROL

A. 3M Safety and Security Window Film with Solar Control: Optically clear polyester film laminated to one or more polyester layers to achieve the desired thickness and solar properties. Film has a durable acrylic abrasion resistant coating over one surface and a pressure sensitive adhesive over the other.

1. Film Type: Safety Affinity S15
2. Film Type: Safety Affinity S65
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. Identification: Labeled as to Manufacturer as listed in this Section.

B. Performance, 3M™ Safety Affinity (AFF-S15) Safety and Security Window Film with Sun Control

1. Physical / Mechanical Performance Properties
   a. Film Color: tinted
   b. Thickness: Nominal 8.5 mils (0.22 mm)
   c. Tensile Strength (ASTM D 882): 32,000 psi
   d. Break Strength (ASTM D 882) (Per Inch Width): 265 lbs/inch
   e. Elongation (ASTM D 882): >100%
   f. Puncture Strength (ASTM D 4830): 173 lbs
2. Solar Performance Properties -- film applied to 1/4 Inch (6.4 mm) thick clear glass:
   b. Visible Reflection (ASTM E 903): Not more than 25 percent
   c. Ultraviolet Transmission (ASTM E 903): Less than 1 percent
   d. Solar Heat Gain Coefficient (ASTM E 903): 0.23
3. Impact Resistance for Safety Glazing (tested on ¼” annealed glass):
   b. Safety Rating (ANSI Z97.1): [RESERVED]
4. Windstorm Protection
   a. Film shall pass impact of Medium Large Missile “C” per ASTM with use of 3M™ Impact Protection Adhesive attachment system

C. Performance, 3M™ Safety Affinity (AFF-S65) Safety and Security Window Film with Sun Control

1. Physical / Mechanical Performance Properties
   a. Film Color: tinted
   b. Thickness: Nominal 8.5 mils (0.22 mm)
   c. Tensile Strength (ASTM D 882): 32,000 psi
   d. Break Strength (ASTM D 882) (Per Inch Width): 265 lbs/inch
   e. Elongation (ASTM D 882): >100%
   f. Puncture Strength (ASTM D 4830): 173 lbs
2. Solar Performance Properties -- film applied to 1/4 Inch (6.4 mm) thick clear glass:
   b. Visible Reflection (ASTM E 903): Not more than 8 percent
   c. Ultraviolet Transmission (ASTM E 903): Less than 1 percent
   d. Solar Heat Gain Coefficient (ASTM E 903): 0.64
3. Impact Resistance for Safety Glazing (tested on ¼” annealed glass):
   a. Safety Rating (CPSC 16 CFR, Part 1201): Category II (400 ft-lbs)
b. Safety Rating (ANSI Z97.1): Class A, Unlimited (400 ft-lbs)

4. Windstorm Protection
   a. Film shall pass impact of Medium Large Missile “C” and withstand subsequent pressure cycling (per ASTM’s E1996 and E1886) at 50 psf Design Pressure with use of 3M™ Impact Protection Adhesive attachment system

PART 3 EXECUTION

3.1 EXAMINATION
   A. Do not begin installation until substrates have been properly prepared.
   B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

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.

3.3 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 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