

SPECIFICATIONS FOR 3M™ ANTI-GRAFFITI WINDOW FILM

SCOPE

This specification is for a graffiti resistant and abrasion resistant window film which, when applied to the interior or exterior window surface, will provide resistance to typical graffiti materials such as glass etchants, gauging, abrasion, and reduce the ultra-violet light that normally would enter through the window by 99%. The film shall be called 3M™ AG-4 or AG-6 Anti-Graffiti Window Film.

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. 3M™ Anti-Graffiti Film

1.2 RELATED SECTIONS

[RESERVED]

1.3 REFERENCES

- A. ASHRAE - American Society for Heating, Refrigeration, and Air Conditioning Engineers; Handbook of Fundamentals, 1997 Edition.
- B. ASTM D 1044 - Standard Method of Test for Resistance of Transparent Plastics to Surface Abrasion (Taber Abrader Test).
- C. ASTM D 4830 -- Standard Test Methods for Characterizing Thermoplastic Fabrics Used in Roofing and Waterproofing
- D. ASTM E 84 - Standard Method of Test for Surface Burning Characteristics of Building Materials.
- E. ASTM E 308 - Standard Recommended Practice for Spectrophotometry and Description of Color in CIE 1931 System.
- F. ASTM E 903 - Standard Methods of Test for Solar Absorbance, Reflectance and Transmittance of Materials Using Integrating Spheres.
- G. ASTM G 26 - Standard Practice for Performing Accelerated Outdoor Weatherizing for Non-metallic Materials Using Concentrated Natural Sunlight.
- H. ASTM D 882 (2009) – Standard Test Method for Tensile Properties of Thin Plastic Sheeting

1.4 PERFORMANCE REQUIREMENTS

- A. Film Material:
The film material shall consist of an optically clear 4 mil (0.004 inches) or 6 mil (0.006 inches) polyester film with a durable acrylic abrasion resistant coating over one surface and a pressure sensitive adhesive and liner on the other. The film color is clear and will not contain dyed polyester. There shall be no evidence of coating voids. The film shall be Identified as to Manufacturer of Origin (hereafter to be called Manufacturer).
- B. Visible Light Transmission:
When applied to 1/4' (6mm) clear glass, the luminous transmittance shall be nominal when measured with an integrating sphere spectrophotometer as referenced by ASTM E-903 and calculated per ASTM E-308 using Standard Source 'C' for average daylight.
- C. Reflection - Visible:
When applied to 1/4' (6mm) clear glass, the total luminous reflection from the glass surface shall be nominal when measured with an integrating sphere spectrophotometer as

referenced by ASTM E-903 and calculated per ASTM E-308 using Standard CIE Source 'C' for average daylight.

- D. Transmission - Ultraviolet Light:
When applied to 1/4' (6mm) clear glass, the total transmission of solar ultraviolet radiation of air mass = 2 over the spectral range of 3000 to 3800 angstroms shall not exceed when measured with an integrating sphere spectrophotometer as referenced by ASTM E-903.
- E. Adhesive System:
The film shall be supplied with a high mass pressure sensitive weatherable acrylate adhesive applied uniformly over the surface opposite the abrasion resistant coated surface. The adhesive shall be essentially optically flat and shall meet the following criteria:
 - a. Viewing the film from a distance of ten feet at angles up to 45 degrees from either side of the glass, the film itself shall not appear distorted.
- F. Abrasion Resistance:
The Manufacturer shall provide independent test data showing that the film has a surface coating that is resistant to abrasion such that, less than 5% increase of transmitted light haze will result in accordance with ASTM D-1044 using 100 cycles, 500 grams weight, and the CS I OF Calbrase Wheel.
- G. Flammability:
Surface burning characteristics when tested in accordance with ASTM E84:
 - a) Flame Spread Index: 25, maximum
 - b) Smoke Developed Index, 450, maximum

1.5 SUBMITTALS

- A. [RESERVED]
- 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. Verification Samples: For each finished product specified, two samples representing the actual product, color and patterns.

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: The installer shall provide documentation showing authorization by the Manufacturer of the window film to install said window film as per the Manufacturer's specifications and in accordance with specific requests as to be determined and agreed to by the customer. Authorization of dealership may be verified through the Manufacturer's assigned ID Number.
- C. Mock-up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship

1.7 DELIVERY, STORAGE, AND HANDLING

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

1.8 PROJECT CONDITIONS

- A. Outdoor application should be done when the air temperature is not expected to fall below 32° F, or 0°C within 72 hours. Indoor application should be done when the glass temperature is not expected to fall below 32° F, or 0°C for 72 hours.

- B. Preparation: The window and window framing will be cleaned thoroughly with a pH-neutral cleaning solution. The surface of the window glass shall be bladed with stainless steel razors to facilitate the removal of any foreign contaminants. Toweling or other absorbent material shall be placed on the window sill or sash to absorb moisture accumulation generated by the film application.

1.9 WARRANTY

- A. 3M™ Anti-graffiti films are warranted for a period of 1 year when installed outdoors and for a period of 10 years when installed indoors.
- B. 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 Authorized Window Film Dealer Point of Contact: John French, 1-866-750-2739 jfrench@apexwindowfilms.com
- B. Substitutions: Not permitted
- C. [RESERVED]

2.2 3M™ ANTI-GRAFFITI WINDOW FILM

- A. 3M™ Anti-Graffiti 4 (AG-4)
- B. 3M™ Anti-Graffiti 6 (AG-6)

2.3 PERFORMANCE, 3M™ Anti-Graffiti 4 (AG-4)

- A. Physical / Mechanical Performance Properties
 - a. Film Color: Clear
 - b. Thickness: Nominal 4.0 mils (0.10 mm)
 - c. Tensile Strength (ASTM D 882): 34,900 psi
 - d. Break Strength (ASTM D 882) (Per Inch Width): 136 lbs
 - e. Elongation at Break (ASTM D 882): >100%
 - f. Peel Strength: 1,000 g/inch
 - g. Puncture Strength (ASTM D 4830): 93 lbs
 - h. Abrasion Resistance (ASTM D1044): < 5% increase in haze
- B. Solar Performance Properties -- film applied to 1/4 Inch (6.4 mm) thick clear glass:
 - a. Visible Light Transmission (ASTM E 903): 86 percent.
 - b. Total Solar 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): 0.81

2.4 PERFORMANCE, 3M™ Anti-Graffiti 6 (AG--6)

- A. Physical / Mechanical Performance Properties
 - a. Film Color: Clear
 - b. Thickness: Nominal 6.0 mils (0.15 mm)
 - c. Tensile Strength (ASTM D 882): 32,200 psi
 - d. Break Strength (ASTM D 882) (Per Inch Width): 190 lbs
 - e. Elongation at Break (ASTM D 882): >100%
 - f. Peel Strength: 1,000 g/inch
 - g. Puncture Strength (ASTM D4830): 132 lbs
 - h. Abrasion Resistance (ASTM D1044): < 5% increase in haze

- B. Solar Performance Properties -- film applied to 1/4 Inch (6.4 mm) thick clear glass:
 - a. Visible Light Transmission (ASTM E 903): 86 percent.
 - b. Total Solar 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): 0.81

PART 3 EXECUTION

3.1 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
- B. Examination: 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. Correct any and all such deficiencies before starting film application

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.