

# Specifications For 3M Plus All Season Low E Window Film

## 1.0 Scope

This specification is for an abrasion resistant Low E window film which when applied to the interior window surface will retard the flow of heat energy through the window. The film shall be called 3MTM Scotchtint™ Plus All Season Window Film LE35AMARL Medium Amber. .

## 2.0 Applicable Documents

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

The 1985 American Society for Heating, Refrigeration, and Air Conditioning Engineers (ASH RAE) Handbook of Fundamentals.

The American Society for Testing and Materials (ASTM) publication:

ASTM E-308 Standard Recommended Practice for Spectrophotometry and Description of Color in CIE 1931 System

ASTM E-903 Standard Methods of Test for Solar Absorbance, Reflectance and Transmittance of Materials Using Integrating Spheres

ASTM D-1044 Standard Method of Test for Resistance of Transparent Plastics to Surface Abrasion (Taber Abrader Test)

ASTM G-90 Standard Practice for Performing Accelerated Outdoor Weatherizing for Non-metallic Materials Using Concentrated Natural Sunlight

ASTM E-84 Standard Method of Test for Surface Burning Characteristics of Building Material

Window 4.0, A Computer Tool for Analyzing Window Thermal Performance, Lawrence Berkeley Laboratory

## 3.0 Requirements of the Film

**3.1 Film Material:** The film material shall be an optically clear metallized polyester film laminated to a clear polypropylene film with a durable acrylic abrasion resistant coating over the polypropylene film which will provide a low emissivity surface. The film color is derived from a metal coating and the product will not contain dyed polyester. The metallic coating shall be uniform without noticeable pinholes, streaks, thin spots, scratches or banding. The film shall have a nominal thickness of 1.5 mils (0.0015 inches). The density of the film across the web is not to exceed plus or minus 2%. There shall be no evidence of coating voids. The film shall be identified as to Manufacturer of Origin (hereafter to be called Manufacturer).

**3.2 Emissivity:** The emissivity of the non-adhesive surface of the film shall be 0.34 nominal when measured using a Devices & Services Emissometer Model AE at or near room temperature. The Manufacturer shall provide laboratory data of emissivity and calculated window "U" Values for various outdoor temperatures based upon established calculation procedure defined by the 1985 ASHRAE Handbook of Fundamentals, ch. 27, or Lawrence Berkeley Laboratory Window 4.0 Computer Program.

**3.3 U Value:** The U Value of the film applied to 1/4" (6mm) double pane clear glass shall be 0.40 nominal when measured in accordance with test procedures described in 3.2 for Emissivity.

**3.4 Transmission - Visible:** When applied to 1/4" (6mm) double pane clear glass, the luminous transmittance shall be 29% 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.

**3.5 Reflection - Visible:** When applied to 1/4" (6mm) double pane clear glass, the total luminous reflection from the glass surface shall be 54% 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.

**3.6 Transmission - Ultraviolet Light:** When applied to 1/4" (6mm) double pane 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 1% when measured with an integrating sphere spectrophotometer as referenced by ASTM E-903.

**3.7 Shading Coefficient:** When applied to 1/4" (6mm) double pane clear glass, the shading coefficient shall be 0.35 nominal when solar energy transmittance and reflection are measured per ASTM E-903 and the shading coefficient is computed in accordance with the established procedures defined by The ASH RAE Handbook of Fundamentals.

**3.8 Solar Heat Gain Coefficient:** When applied to 1/4" (6mm) double pane clear glass, the solar heat gain coefficient shall be 0.20 nominal when solar energy transmittance and reflection are measured per ASTM E-903 and the solar heat gain coefficient is computed in accordance with the established procedures defined by The ASH RAE Handbook of Fundamentals.

**3.9 Adhesive System:** The film shall be supplied with a pressure sensitive weatherable acrylate adhesive applied uniformly over the surface opposite the low emissivity surface. A water soluble detackifier shall be incorporated over the pressure sensitive adhesive to facilitate handling. The adhesive shall be essentially optically flat and shall meet the following criteria:

- a. Viewing the film from a distance of ten feet (3 m) at angles up to 45 degrees from either side of the glass, the film itself shall not appear distorted.
- b. It shall not be necessary to seal around the edges of the applied film system with a lacquer or other substance in order to prevent moisture or free water from penetrating under the film system.

**3.10 Flammability:** The Manufacturer shall provide independent test data showing that the window film shall meet the requirements of a Class A Interior Finish for Building Materials for both Flame Spread Index and Smoke Development Values per ASTM E-84.

**3.11 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 scattered light and haze will result in accordance with ASTM D-1044 using 100 cycles, 500 grams weight, and the CS10F Calbrase Wheel.

#### 4.0 Requirements of the Authorized Dealer/Applicator (ADA)

4.1 The ADA shall provide documentation that the ADA is certified by the Manufacturer to install window film as per the Manufacturer's specifications and in accordance with specific requests as to be determined and agreed to by the customer.

4.2 Authorization of dealership may be verified through the company's 3M I.D. Number.

4.3 The ADA will provide a commercial building reference list of Five (5) properties where the ADA has installed window film. This list will include the following information: Please see Appendix A for attached list.

- \* Name of building
- \* The name and telephone number of a management contact
- \* Type of glass
- \* Type of film
- \* Amount of film installed
- \* Date of completion

4.4 Upon request, the ADA will provide a Glass Stress Analysis of the existing glass and proposed glass/film combination as recommended by the film Manufacturer.

4.5 Upon request, the ADA will provide an application analysis to determine available energy cost reduction and savings.

#### 5.0 Requirements of the Manufacturer

5.1 The Manufacturer will insure proper quality control during production, shipping and inventory, clearly identify and label each film core with the product designation and run number.

5.2 The Manufacturer will, upon request and pre-approval, provide 100% financing for the complete installation of the window film to the end-user customer in either an installment purchase or lease purchase format to be decided upon by customer.

5.3 Materials shall be manufactured by:  
3M Consumer Safety and Light Management Department

## 6.0 Application

**6.1 Examination:** Examine glass surfaces to receive new film and verify that they are free from defects and imperfections which will affect the final appearance. Correct all such deficiencies before starting film application.

### 6.2 Preparation:

- a. The window and window framing will be cleaned thoroughly with a neutral cleaning solution. The inside surface of the window glass shall be bladed with industrial razors to insure the removal of any foreign contaminant's.
- b. Toweling or other absorbent material shall be placed on the window sill or sash to absorb moisture accumulation generated by the film application.

**6.3 Installation:** The film shall be applied as to the specifications of the Manufacturer by an ADA.

- a. Materials will be delivered to the job site with the manufacturer's labels intact and legible
- b. To minimize waste, the film will be cut to specification utilizing a vertical dispenser designed for that purpose. Film edges shall be cut neatly and square at a uniform distance of 1/8" to 1/16" of the window sealing device.
- c. Clear, clean water will be used to remove the water soluble overcoat that protects the pressure sensitive adhesive. Water and film slip solution only will be used on the window glass to facilitate the proper positioning of the film.
- d. To insure efficient removal of excess water from the underside of the film and to maximize bonding of the pressure sensitive adhesive, polyplastic bladed squeegees will be utilized.
- e. Upon completion, the film may have a dimpled appearance from residual moisture. Said moisture shall, under reasonable weather conditions, dry flat with no moisture dimples within a period of 30 calendar days when viewed under normal viewing conditions.
- f. After installation, any left over material will be removed and the work area will be returned to original condition. Use all necessary means to protect the film before, during and after the installation.

## 7.0 Cleaning

The film may be washed using common window cleaning solutions, including ammonia solutions, 30 days after application. Abrasive type cleaning agents and bristle brushes which could scratch the film must not be used. Synthetic sponges or soft cloths are recommended.

## 8.0 Warranty

8.1 The application shall be warranted by the film manufacturer (3M) for a period of five (5) years in that the film will maintain solar reflective properties without cracking, crazing, delaminating, bubbling or peeling. In the event that the product is found to be defective under warranty, the seller will replace such quantity of the film proved to be defective, and will additionally provide the removal and reapplication labor free of charge.

8.2 The film manufacturer (3M) also warrants against glass failure due to thermal shock fracture of the glass and/or seal failure of the window unit (maximum value \$500 per window) provided the film is applied to recommended types of glass and the failure occurs within sixty (60) months from the start of application. Any glass failure or seal failure must be reviewed by the film manufacturer (3M) prior to replacement.

# 3M™ Plus All Season Low E Window Film

Title

1.0	Scope	<b>LE35AMARL</b>
3.1	Thickness	
	(mils)	1.5
	(inches)	0.0015
3.2	Emissivity	0.34
3.3	U Value	0.40
3.4	Transmission - Visible	31%
3.5	Reflection - Visible	56%
3.6	Transmission - Ultraviolet	<1%
3.7	Shading Coefficient	0.35
3.8	Solar Heat Gain Coefficient	0.20

**Specifications**