

SECTION 08 87 13

SOLAR CONTROL FILM
08/09

PART 1 GENERAL

1.1 REFERENCES

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

ASTM INTERNATIONAL (ASTM)

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| ASTM D1004 | (2013) Initial Tear Resistance of Plastic Film and Sheeting |
| ASTM C1048 | (2012; E 2012) Standard Specification for Heat-Treated Flat Glass - Kind HS, Kind FT Coated and Uncoated Glass |
| ASTM D1044 | (2013) Resistance of Transparent Plastics to Surface Abrasion |
| ASTM D882 | (2012) Tensile Properties of Thin Plastic Sheeting |
| ASTM E84 | (2014) Standard Test Method for Surface Burning Characteristics of Building Materials |
| ASTM E308 | (2013) Computing the Colors of Objects by Using the CIE System |

NATIONAL FENESTRATION RATING COUNCIL (NFRC)

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| NFRC 100 | (2014) Procedure for Determining Fenestration Product U-Factors |
| NFRC 200 | (2014) Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence |

1.2 SYSTEM DESCRIPTION

1.2.1 General Requirements

The applied interior window film shall be clean and free of peeling, splitting, scratches, creases, wrinkles, discoloration, and foreign particles. The film application shall be free of air bubbles after 30 days. Film shall not show signs of waviness and distortion at the time the work is accepted. This determination shall be made by the unaided eye (except for corrective prescription glasses), when the film is viewed from a distance of 10 feet from the interior room side at angles up to 45 degrees when looking at a clear or uniformly overcast sky. Unacceptable

film applications shall be removed in accordance with manufacturer's instructions and new film applied.

1.2.2 Other Submittals Requirements

The following shall be submitted for solar control film:

- a. Manufacturer's data consisting of catalog cuts, brochures, circulars, and a list of glazing compounds and/or gaskets known to be incompatible with the solar control film.
- b. Manufacturer's application and cleaning instructions for solar control film.
- d. A sample consisting of a minimum 8 by 11 inch section of solar control film including the adhesive layer.
- e. Certified test reports including analysis and interpretation of test results. Each report shall identify the manufacturer, the specific product name, the film thickness, the adhesive type and thickness, and the glass type and thickness. Test reports shall clearly identify the methods used and shall include the results recorded.
- f. On applications where the film will contact the glazing beads or gaskets, a certificate from the Contractor stating that the glazing compounds and gaskets are compatible with the solar control film and adhesive.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. Submittals with an "S" are for inclusion in the Sustainability Notebook, in conformance to Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Solar Control Film
Cleaning

SD-04 Samples

Solar Control Film; G

SD-06 Test Reports

Solar Control Film

SD-07 Certificates

Solar Control Film

1.4 QUALITY ASSURANCE

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. Provide documentation that the installer is authorized by the Manufacturer to perform Work specified in this section.

1.5 DELIVERY, STORAGE, AND HANDLING

The Contractor is responsible for delivery of the solar control film to the appropriate location for application. Solar control film shall be delivered, stored, and handled in accordance with the manufacturer's recommendations. Provide each roll of film with a tamperproof label containing full details of the roll, the batch number, and sufficient information to enable the Contracting Officer to ensure that the correct film is supplied.

1.6 WARRANTY

Furnish a 10 year warranty for solar control film material, providing for replacement of film if fading, cracking, crazing, peeling, or inadequate adhesion occurs.

PART 2 PRODUCTS

2.1 STANDARD PRODUCTS

Provide solar control film which is the standard product of a manufacturer regularly engaged in the manufacture of such products and that essentially duplicate items that have been in satisfactory use for at least 10 years prior to bid opening.

2.2 SOLAR CONTROL FILM

Solar Control film shall be polyester, , or a composite, optically clear and free of waves, distortions, impurities, and adhesive lines. Film shall incorporate pressure sensitive adhesive on one side and an acrylic abrasion resistant coating on the other. Solar Control film shall not contain any dyes.

PHYSICAL PROPERTIES:

1. Uniformity: No noticeable pin holes, streaks, thin spots, scratches, banding or other optical defects.
2. Variation in Total Transmission across the Width: Less than 2 percent over the average at any portion along the length.
3. Thickness: Nominal 2.0 mils (0.1 mm) with no evidence of coating voids.
4. Identification: Labeled as to Manufacturer as listed in this Section.

2.2.1 Tensile Strength

The solar control film samples tested shall exhibit a minimum tensile strength at break of 25,000 psi, when tested in accordance with ASTM D882. Method A, Static Weighing, Constant Rate of Grip Separation Test, shall be used to conduct this test. The rate of grip separation shall not exceed 1/2 inch per minute.

2.2.2 Tear Resistance

The solar control film shall exhibit a minimum Graves Tear Resistance of 13 lbs and Graves Area Tear Resistance of 780 lbs% when tested in accordance with ASTM D1004.

2.2.3 Solar Performance Properties

The solar control film shall exhibit the following minimum characteristics as tested in accordance to NFRC 100, NFRC 200 and ASTM E308 in applications of 1/4" clear glass.

1. Visible Light Transmission (NFRC 100/200, ASTM E 308): 68 percent or higher.
2. Visible Reflection - Exterior (NFRC 100/200): 9 percent or lower.
3. Visible Reflection - Interior (NFRC 100/200): 9 percent or lower.
4. Ultraviolet Rejected (NFRC 100/200): 99 percent or higher.
5. Infrared Energy Rejected (NFRC 100/200): Up to 97 percent; as measured between 900-1000 nm.
6. Light to Solar Gain Ratio: 1.4 or higher.
7. Solar Heat Gain Coefficient (Normal Incidence) (NFRC 100/200): 0.50 +/- 0.10.
8. Total Solar Energy Rejected (TSER) at 90 Degrees (Normal Incidence) (NFRC 100/200): 50 percent or higher.
9. Total Solar Energy Rejected (TSER) at 60 Degrees (NFRC 100/200): 59 percent or higher..

2.2.4 Abrasion Resistance

The Manufacturer shall provide independent test data showing that the film shall 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 D1044 using 100 cycles, 500 grams weight, and the CS10FC abra-se Wheel.

2.2.5 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.
- b. Film shall be of the type that it does not require 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.

2.2.6 Flame Spread and Smoke Density

The solar control film shall exhibit a flame spread index not exceeding 25, smoke developed index not exceeding 450 and a smoke density index not exceeding 100 when tested in accordance with ASTM E84. For the test, the specimen shall be mounted to 1/4 inch thick tempered glass which conforms to the requirements of ASTM C1048, Kind FT, Type I, Class 1, Quality q3.

PART 3 EXECUTION

3.1 SURFACE PREPARATION

Clean the glass surface, to which the solar control film is to be applied, of paint, foreign compounds, smears, and spatters. After the initial cleaning, further clean the surface to receive the film in accordance with the film manufacturer's instructions.

3.2 APPLICATION

Provide solar control film on windows where indicated. After surface preparation, apply the solar control film in accordance with the manufacturer's recommendations and instructions. Film shall be applied to the interior (room) side of the glass for both single and double glazed sheets, unless otherwise indicated. Multiple applications of film to achieve specified properties is not allowed. The film shall not be applied if there are visible dust particles in the air, if there is frost on the glazing, or if any room condition such as temperature and humidity do not meet the manufacturer's instructions. After film application, maintain room conditions as required by the manufacturer's instructions to allow for proper curing of the adhesive.

3.2.1 Application to Existing Glass Without Dismantlement

Solar Control film shall be cut neatly, square and applied so that it extends to within 1/16 inch, with a maximum of 1/8 inch, of the edge of the visible glass area.

3.2.2 Splicing

Splices or seams in solar control film are permitted only when a sheet of glass has a dimension exceeding the available manufactured film sizes. All seams shall be applied with a minimum overlap of 1/4 inch unless submitted test reports indicate impact performance is not diminished when seam is applied with a different overlap or a gap.

3.3 CLEANING

Clean the solar control film in accordance with the manufacturer's instructions.

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 --