

SOLAR CONTROL FILMS
LLumar Exterior Series

Note: Click on "Show/Hide ¶" button to reveal "Specifier Notes" throughout section. Delete this text when editing is complete.

PART 1 - GENERAL**1.1 CONDITIONS AND REQUIREMENTS**

- A. The General Conditions, Supplementary Conditions, and Division 01 – General Requirements apply.

1.2 SECTION INCLUDES

- A. Solar control films.
- B. [Insert item description.]

1.3 RELATED SECTIONS

- A. Section 08 80 00 - Glazing: Substrate for application of solar control film.
- B. Section [xxxxx] – [Section Title]: [Include brief description of work specified in another section that is related to the work of this section.]

1.4 REFERENCES

- A. ASTM International (ASTM):
 - 1. ASTM E903 - Test Method for Solar Absorptance, Reflectance, and Transmittance of Materials Using Integrating Spheres.

1.5 DEFINITIONS

- A. Exterior films: solar control or clear glass retention films applied to exterior face of the glazing that supply heat and glare reduction or glass retention.

1.6 PERFORMANCE REQUIREMENTS

- A. Ultraviolet Transmission: Provide solar control films with UV absorbing materials that limit the weighted UV Transmission to one (1) percent or less when measured according to ASTM E903.
- B. Provide solar control films that do not have a masking sheet.

1.7 SUBMITTALS

- A. Submit under provisions of Section [01 33 00] [_____].
- B. Product Data: Submit for each product specified indicating:
 - 1. Performance properties.

2. Preparation and installation instructions and recommendations.
 3. Storage and handling recommendations.
- C. Samples: For each type of solar control film specified, two (2) samples, 12 inches square.
 - D. Qualification Data: Submit documentation indicating qualifications of solar control film manufacturer.
 - E. Operation and Maintenance Data: Submit for solar control film to include in maintenance manuals.
 - F. Warranty: Submit sample special warranty specified in this section.

1.8 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A qualified manufacturer that has a minimum of 10 years of documented experience manufacturing solar control films similar to be used for this project.
- B. Installer Qualifications: A firm that is authorized by solar control film manufacturer to install film in accordance with guidelines set forth by the manufacturer.
- C. Source Limitations: Obtain each type of solar control film from same manufacturer.
- D. Mock-ups: Build mock-ups to verify selections made under sample submittals and to evaluate surface preparation techniques and application workmanship.
 1. Construct mock-ups in the location and of the size indicated or, if not indicated, as directed by Architect.
 2. Approved mock-ups may become part of the completed work if undisturbed at time of Substantial Completion.
- E. Pre-installation Conference: Conduct conference at project site to discuss methods and procedures relating to installation of the solar control films.

1.9 DELIVERY, STORAGE AND HANDLING

- A. Deliver, store and handle materials in manufacturer's protective packaging.
- B. Store and protect materials according to manufacturer's written recommendations to prevent damage from condensation, temperature changes, direct exposure to sun, or other causes.

1.10 SITE CONDITIONS

- A. Ambient Conditions: Maintain temperature, humidity, and ventilation within limits recommended by manufacturer.

1.11 LIMITED WARRANTY

- A. Manufacturer's Limited Warranty: Certain restrictions apply. The Manufacturer's Limited Warranty can be viewed in full by [clicking here](#).

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis-of-Design Product: The design for solar-control exterior films is based on LLumar® Solar-Control Exterior Series Films manufactured by an Eastman Performance Films, LLC, 575

Maryville Centre Drive, St. Louis, Missouri 63141; Telephone: 800-851-7781 (Option 2); <https://northamerica.llumar.com/contact-llumar>; Web Site: www.llumar.com.

- B. Representative: [Insert contact information.]
- C. Substitutions will be considered, subject to compliance with requirements of this section, under provisions of Section 01 60 00.

2.2 SOLAR CONTROL FILMS

- A. Solar Control Film: LLumar® NHE20ERHPR Exterior Solar Control Film with the following performance characteristics when applied to the exterior surface of single-pane, 1/4-inch clear glass:

% Total Solar Transmittance	19
% Total Solar Reflectance	29
% Total Solar Absorptance	52
% Visible Light Transmission	23
% Visible Light Reflection - Exterior	30
% Visible Light Reflection - Interior	26
Winter U-Value	1.03
Shading Coefficient	0.41
% Ultraviolet Ray Protection (300nm-380nm)	>99
Emissivity	0.86
Solar Heat Gain Coefficient	0.35
% Total Solar Energy Rejected	65
Light-to-Solar Heat Gain Ratio	0.66
% Summer Solar Heat Reduction	57
% Winter Heat Loss Reduction	0
% Glare Reduction	74
Thickness without Liner	90 μ
Film Color	Exterior Neutral

- B. Solar Control Film: LLumar® NHE35ERHPR Exterior Solar Control Film with the following performance characteristics when applied to the exterior surface of single-pane, 1/4-inch clear glass:

% Total Solar Transmittance	32
% Total Solar Reflectance	18
% Total Solar Absorptance	50
% Visible Light Transmission	37
% Visible Light Reflection - Exterior	19
% Visible Light Reflection - Interior	15
Winter U-Value	1.03
Shading Coefficient	0.54
% Ultraviolet Ray Protection (300nm-380nm)	>99
Emissivity	0.86
Solar Heat Gain Coefficient	0.47
% Total Solar Energy Rejected	53
Light-to-Solar Heat Gain Ratio	0.79
% Summer Solar Heat Reduction	43
% Winter Heat Loss Reduction	0
% Glare Reduction	58

Thickness without Liner	90 μ
Film Color	Exterior Neutral

- C. Solar Control Film: LLumar® RHE20ERHPR Exterior Solar Control Film with the following performance characteristics when applied to the exterior surface of single-pane, 1/4-inch clear glass:

% Total Solar Transmittance	11
% Total Solar Reflectance	63
% Total Solar Absorptance	26
% Visible Light Transmission	15
% Visible Light Reflection - Exterior	62
% Visible Light Reflection - Interior	57
Winter U-Value	1.02
Shading Coefficient	0.22
% Ultraviolet Ray Protection (300nm-380nm)	>99
Emissivity	0.71
Solar Heat Gain Coefficient	0.19
% Total Solar Energy Rejected	81
Light-to-Solar Heat Gain Ratio	0.79
% Summer Solar Heat Reduction	77
% Winter Heat Loss Reduction	1
% Glare Reduction	83
Thickness without Liner	90 μ
Film Color	Exterior Silver

- D. Solar Control Film: LLumar® RHE35ERHPR Exterior Solar Control Film with the following performance characteristics when applied to the exterior surface of single-pane, 1/4-inch clear glass:

% Total Solar Transmittance	20
% Total Solar Reflectance	50
% Total Solar Absorptance	30
% Visible Light Transmission	28
% Visible Light Reflection - Exterior	47
% Visible Light Reflection - Interior	43
Winter U-Value	1.02
Shading Coefficient	0.34
% Ultraviolet Ray Protection (300nm-380nm)	>99
Emissivity	0.72
Solar Heat Gain Coefficient	0.29
% Total Solar Energy Rejected	71
Light-to-Solar Heat Gain Ratio	0.97
% Summer Solar Heat Reduction	65
% Winter Heat Loss Reduction	1
% Glare Reduction	68
Thickness without Liner	90 μ
Film Color	Exterior Silver

- E. Solar Control Film: LLumar® RHE50ERHPR Exterior Solar Control Film with the following performance characteristics when applied to the exterior surface of single-pane, 1/4-inch clear glass:

% Total Solar Transmittance	35
% Total Solar Reflectance	30
% Total Solar Absorptance	35
% Visible Light Transmission	49
% Visible Light Reflection - Exterior	26
% Visible Light Reflection - Interior	24
Winter U-Value	1.02
Shading Coefficient	0.53
% Ultraviolet Ray Protection (300nm-380nm)	>99
Emissivity	0.79
Solar Heat Gain Coefficient	0.46
% Total Solar Energy Rejected	54
Light-to-Solar Heat Gain Ratio	1.07
% Summer Solar Heat Reduction	44
% Winter Heat Loss Reduction	1
% Glare Reduction	44
Thickness without Liner	90 μ
Film Color	Exterior Silver

- F. Solar Control Film: LLumar® SHECLERPS4 Exterior Film with the following performance characteristics when applied to the exterior surface of single-pane, 1/4-inch clear glass:

% Total Solar Transmittance	75
% Total Solar Reflectance	8
% Total Solar Absorptance	17
% Visible Light Transmission	88
% Visible Light Reflection - Exterior	9
% Visible Light Reflection - Interior	9
Winter U-Value	1.03
Shading Coefficient	0.92
% Ultraviolet Ray Protection (300nm-380nm)	>99
Emissivity	0.90
Solar Heat Gain Coefficient	0.80
% Total Solar Energy Rejected	20
Light-to-Solar Heat Gain Ratio	1.10
% Summer Solar Heat Reduction	2
% Winter Heat Loss Reduction	0
% Glare Reduction	0
Thickness without Liner	125 μ
Film Color	Exterior Clear

- G. Solar Control Film: LLumar® SHECLERPS7 Exterior Film with the following performance characteristics when applied to the exterior surface of single-pane, 1/4-inch clear glass:

% Total Solar Transmittance	75
% Total Solar Reflectance	8
% Total Solar Absorptance	17
% Visible Light Transmission	87
% Visible Light Reflection - Exterior	9
% Visible Light Reflection - Interior	9
Winter U-Value	1.03
Shading Coefficient	0.92

% Ultraviolet Ray Protection (300nm-380nm)	>99
Emissivity	0.90
Solar Heat Gain Coefficient	0.80
% Total Solar Energy Rejected	20
Light-to-Solar Heat Gain Ratio	1.09
% Summer Solar Heat Reduction	2
% Winter Heat Loss Reduction	0
% Glare Reduction	1
Thickness without Liner	200 μ
Film Color	Exterior Clear

- H. Solar Control Film: LLumar® THE80ERHPR Exterior Solar Control Film with the following performance characteristics when applied to the exterior surface of single-pane, 1/4-inch clear glass:

% Total Solar Transmittance	36
% Total Solar Reflectance	8
% Total Solar Absorptance	56
% Visible Light Transmission	71
% Visible Light Reflection - Exterior	14
% Visible Light Reflection - Interior	15
Winter U-Value	0.48
Shading Coefficient	0.53
% Ultraviolet Ray Protection (300nm-380nm)	>99
Emissivity	0.89
Solar Heat Gain Coefficient	0.46
% Total Solar Energy Rejected	54
Light-to-Solar Heat Gain Ratio	1.54
% Summer Solar Heat Reduction	39
% Winter Heat Loss Reduction	0
% Glare Reduction	12
Thickness without Liner	90 μ
Film Color	Exterior Light Blue

- I. Solar Control Film: LLumar® VHE14ERHPR Exterior Solar Control Film with the following performance characteristics when applied to the exterior surface of single-pane, 1/4-inch clear glass:

% Total Solar Transmittance	7
% Total Solar Reflectance	60
% Total Solar Absorptance	33
% Visible Light Transmission	9
% Visible Light Reflection - Exterior	59
% Visible Light Reflection - Interior	24
Winter U-Value	1.02
Shading Coefficient	0.19
% Ultraviolet Ray Protection (300nm-380nm)	>99
Emissivity	0.74
Solar Heat Gain Coefficient	0.17
% Total Solar Energy Rejected	83
Light-to-Solar Heat Gain Ratio	0.53
% Summer Solar Heat Reduction	79

% Winter Heat Loss Reduction	1
% Glare Reduction	90
Thickness without Liner	90 μ
Film Color	Exterior Silver

- J. Solar Control Film: Vista™ by LLumar® NXA20ERHPR Exterior Solar Control Film with the following performance characteristics when applied to the exterior surface of single-pane, 1/4-inch clear glass:

% Total Solar Transmittance	19
% Total Solar Reflectance	29
% Total Solar Absorptance	52
% Visible Light Transmission	23
% Visible Light Reflection - Exterior	30
% Visible Light Reflection - Interior	26
Winter U-Value	1.03
Shading Coefficient	0.41
% Ultraviolet Ray Protection (300nm-380nm)	>99
Emissivity	0.86
Solar Heat Gain Coefficient	0.35
% Total Solar Energy Rejected	65
Light-to-Solar Heat Gain Ratio	0.66
% Summer Solar Heat Reduction	57
% Winter Heat Loss Reduction	0
% Glare Reduction	74
Thickness without Liner	90 μ
Film Color	Exterior Neutral

- K. Solar Control Film: Vista™ by LLumar® NXA35ERHPR Exterior Solar Control Film with the following performance characteristics when applied to the exterior surface of single-pane, 1/4-inch clear glass:

% Total Solar Transmittance	32
% Total Solar Reflectance	18
% Total Solar Absorptance	50
% Visible Light Transmission	37
% Visible Light Reflection - Exterior	19
% Visible Light Reflection - Interior	15
Winter U-Value	1.03
Shading Coefficient	0.54
% Ultraviolet Ray Protection (300nm-380nm)	>99
Emissivity	0.86
Solar Heat Gain Coefficient	0.47
% Total Solar Energy Rejected	53
Light-to-Solar Heat Gain Ratio	0.79
% Summer Solar Heat Reduction	43
% Winter Heat Loss Reduction	0
% Glare Reduction	58
Thickness without Liner	90 μ
Film Color	Exterior Neutral

- L. Solar Control Film: Vista™ by LLumar® RXA20ERHPR Exterior Solar Control Film with the following performance characteristics when applied to the exterior surface of single-pane, 1/4-inch clear glass:

% Total Solar Transmittance	11
% Total Solar Reflectance	63
% Total Solar Absorptance	26
% Visible Light Transmission	15
% Visible Light Reflection - Exterior	62
% Visible Light Reflection - Interior	57
Winter U-Value	1.02
Shading Coefficient	0.22
% Ultraviolet Ray Protection (300nm-380nm)	>99
Emissivity	0.71
Solar Heat Gain Coefficient	0.19
% Total Solar Energy Rejected	81
Light-to-Solar Heat Gain Ratio	0.79
% Summer Solar Heat Reduction	77
% Winter Heat Loss Reduction	1
% Glare Reduction	83
Thickness without Liner	90 μ
Film Color	Exterior Silver

- M. Solar Control Film: Vista™ by LLumar® RXA35ERHPR Exterior Solar Control Film with the following performance characteristics when applied to the exterior surface of single-pane, 1/4-inch clear glass:

% Total Solar Transmittance	20
% Total Solar Reflectance	50
% Total Solar Absorptance	30
% Visible Light Transmission	28
% Visible Light Reflection - Exterior	47
% Visible Light Reflection - Interior	43
Winter U-Value	1.02
Shading Coefficient	0.34
% Ultraviolet Ray Protection (300nm-380nm)	>99
Emissivity	0.72
Solar Heat Gain Coefficient	0.29
% Total Solar Energy Rejected	71
Light-to-Solar Heat Gain Ratio	0.97
% Summer Solar Heat Reduction	65
% Winter Heat Loss Reduction	1
% Glare Reduction	68
Thickness without Liner	90 μ
Film Color	Exterior Silver

- N. Solar Control Film: Vista™ by LLumar® RXA50ERHPR Exterior Solar Control Film with the following performance characteristics when applied to the exterior surface of single-pane, 1/4-inch clear glass:

% Total Solar Transmittance	35
% Total Solar Reflectance	30

% Total Solar Absorptance	35
% Visible Light Transmission	49
% Visible Light Reflection - Exterior	26
% Visible Light Reflection - Interior	24
Winter U-Value	1.02
Shading Coefficient	0.53
% Ultraviolet Ray Protection (300nm-380nm)	>99
Emissivity	0.79
Solar Heat Gain Coefficient	0.46
% Total Solar Energy Rejected	54
Light-to-Solar Heat Gain Ratio	1.07
% Summer Solar Heat Reduction	44
% Winter Heat Loss Reduction	1
% Glare Reduction	44
Thickness without Liner	90 μ
Film Color	Exterior Silver

- O. Solar Control Film: Vista™ by LLumar® SXACLERPS4 Exterior Film with the following performance characteristics when applied to the exterior surface of single-pane, 1/4-inch clear glass:

% Total Solar Transmittance	75
% Total Solar Reflectance	8
% Total Solar Absorptance	17
% Visible Light Transmission	88
% Visible Light Reflection - Exterior	9
% Visible Light Reflection - Interior	9
Winter U-Value	1.03
Shading Coefficient	0.92
% Ultraviolet Ray Protection (300nm-380nm)	>99
Emissivity	0.90
Solar Heat Gain Coefficient	0.80
% Total Solar Energy Rejected	20
Light-to-Solar Heat Gain Ratio	1.10
% Summer Solar Heat Reduction	2
% Winter Heat Loss Reduction	0
% Glare Reduction	0
Thickness without Liner	125 μ
Film Color	Exterior Clear

- P. Solar Control Film: Vista™ by LLumar® SXACLERPS7 Exterior Film with the following performance characteristics when applied to the exterior surface of single-pane, 1/4-inch clear glass:

% Total Solar Transmittance	75
% Total Solar Reflectance	8
% Total Solar Absorptance	17
% Visible Light Transmission	87
% Visible Light Reflection - Exterior	9
% Visible Light Reflection - Interior	9
Winter U-Value	1.03
Shading Coefficient	0.92

% Ultraviolet Ray Protection (300nm-380nm)	>99
Emissivity	0.90
Solar Heat Gain Coefficient	0.80
% Total Solar Energy Rejected	20
Light-to-Solar Heat Gain Ratio	1.09
% Summer Solar Heat Reduction	2
% Winter Heat Loss Reduction	0
% Glare Reduction	1
Thickness without Liner	200 μ
Film Color	Exterior Clear

- Q. Solar Control Film: Vista™ by LLumar® TXA80ERHPR Exterior Solar Control Film with the following performance characteristics when applied to the exterior surface of single-pane, 1/4-inch clear glass:

% Total Solar Transmittance	36
% Total Solar Reflectance	8
% Total Solar Absorptance	56
% Visible Light Transmission	71
% Visible Light Reflection - Exterior	14
% Visible Light Reflection - Interior	15
Winter U-Value	0.48
Shading Coefficient	0.53
% Ultraviolet Ray Protection (300nm-380nm)	>99
Emissivity	0.89
Solar Heat Gain Coefficient	0.46
% Total Solar Energy Rejected	54
Light-to-Solar Heat Gain Ratio	1.54
% Summer Solar Heat Reduction	39
% Winter Heat Loss Reduction	0
% Glare Reduction	12
Thickness without Liner	90 μ
Film Color	Exterior Blue

- R. Solar Control Film: Vista™ by LLumar® VXA14ERHPR Exterior Solar Control Film with the following performance characteristics when applied to the exterior surface of single-pane, 1/4-inch clear glass:

% Total Solar Transmittance	7
% Total Solar Reflectance	60
% Total Solar Absorptance	33
% Visible Light Transmission	9
% Visible Light Reflection - Exterior	59
% Visible Light Reflection - Interior	24
Winter U-Value	1.02
Shading Coefficient	0.19
% Ultraviolet Ray Protection (300nm-380nm)	>99
Emissivity	0.74
Solar Heat Gain Coefficient	0.17
% Total Solar Energy Rejected	83
Light-to-Solar Heat Gain Ratio	0.53
% Summer Solar Heat Reduction	79

% Winter Heat Loss Reduction	1
% Glare Reduction	90
Thickness without Liner	90 μ
Film Color	Exterior Silver

2.3 SOLAR CONTROL FILM ACCESSORIES

- A. General: Provide accessories either manufactured by or acceptable to solar control film manufacturer for application indicated, and with a proven record of compatibility with surfaces contacted in installation.
- B. Adhesive: Pressure-Sensitive system. This adhesive is activated by pressure and water. It is characterized by its permanently tacky nature.
- C. Cleaners, Primers, and Sealers: Types recommended by solar control film manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates for compliance with requirements and for conditions affecting performance of solar control film including glass that is broken, chipped, cracked, abraded, or damaged in any way.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions for surface preparation.
- B. Clean substrates thoroughly prior to installation.
- C. Prepare substrates using methods recommended by film manufacturer to achieve the best results for the substrate under project conditions.
- D. Protect window frames and surrounding surfaces to prevent damage during installation.

3.3 INSTALLATION

- A. Install in accordance with manufacturer's written instructions, Technical Bulletin TBF-73 and TBF-81.
- B. Install with no gaps or overlaps.
- C. If seamed, make seams non-overlapping.
- D. Do not remove release liner from film until just before each piece of film is cut and ready for installation.
- E. Custom cut to the glass with neat, square corners and edges to within 1/8-inch of the window frame. Use Film-On® or Baby-Shampoo solution for the application.
- F. Remove air bubbles, blisters, and other defects. Be careful to remove "fingers" to eliminate any contamination or excess water pockets. It is crucial to remove as much water as possible during installation.
- G. Once the film is installed and borders dried for at least several hours, all edges must be sealed to prevent edge delamination and possible metal corrosion. Edge Sealing must be as follows: Use Dow Corning 795, Dow Corning 995, Dow Corning 1199 (clear), or other comparable

neutral-cure (non-acidic) weatherable silicone sealant (see options in LLumar Technical Bulletin TBF-73 and TBF-81).

3.4 FIELD QUALITY CONTROL

- A. After installation, view film from a distance of 10 feet against a bright uniform sky or background. Film shall appear uniform in appearance with no visible streaks, wrinkles, banding, thin spots or pinholes.
- B. If installed film does not meet these criteria, remove and replace with new film.

3.5 CLEANING AND PROTECTION

- A. Remove excess mounting solution at finished seams, perimeter edges, and adjacent surfaces.
- B. Use cleaning methods recommended by film manufacturer. Note: Special cleaning instructions for cleaning exterior films should be provided to building maintenance following film installation.
- C. Replace films that cannot be cleaned.
- D. Protect installed products until completion of project.
- E. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

EASTMAN



For inquiries inside the U.S. and Canada

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Advanced Materials - Performance Films
P.O. Box 5068
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1-800-2LLUMAR
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For inquiries outside the U.S. and Canada

Contact your regional technical services representative or visit www.llumar.com.

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