SECTION 08 87 23

SAFETY AND SECURITY FILM

\*\* NOTE TO SPECIFIER \*\* Solar Gard®; Armorcoat and Panorama Safety and Security Films.

This section is based on the products of Solar Gard®, which is located at:
4540 Viewridge Ave
San Diego, CA 92123.
Toll Free: (877) 273-4364.
Tel: (858) 576-0200.
Fax: (858) 571-3605.
Email:info@solargard.com
Web:[www.solargard.com](http://www.solargard.com)

[[Click Here](http://www.arcat.com/arcatcos/cos41/arc41218.html)] for additional information.

Saint-Gobain Solar Gard, an industry expert in film and coating solutions for more than 40 years manufacturing high quality films composed of incredibly strong, optically clear, high quality polyester, high-grade ultraviolet inhibitors and special laminating and mounting adhesives, with a protective, scratch-resistant coating.

Solar Gard solar control window films are designed to offer the best experience in terms of comfort, energy savings, and aesthetics. Solar Control films can reject up to 86% of the sun’s total solar energy to improve occupant comfort, reduce energy consumption, and improve exterior aesthetics. Both clear and solar safety versions block 99% of the sun’s destructive ultraviolet rays to provide protection from premature fading and deterioration of furnishings.

Solar Gard Armorcoat® Safety & Security Films have been securing buildings around the world for decades, including some of the most prominent government facilities in the U.S. [Solar Gard](https://www.solargard.com/uk/whysolargard/) Armorcoat has been rigorously tested to globally recognized standards, including ISO, GSA and ASTM. Globally, schools have also benefited from the added layer of protection safety film provides.

Saint-Gobain Solar Gard is the first window film manufacturer to complete a full Life Cycle Assessment (LCA) of its architectural window film products, resulting in third-party verified Environmental Product Declarations (EPDs). These EPDs provide transparent, standardized data on the environmental impact of Solar Gard’s products, reinforcing the company’s commitment to sustainability and responsible manufacturing.

1. GENERAL
	1. SECTION INCLUDES

\*\* NOTE TO SPECIFIER \*\* Delete sections below not required for the project.

* + 1. Safety and Security film field applied to existing glass.
		2. Safety and Security film factory applied to glazed surfaces.
	1. REFERENCES

\*\* NOTE TO SPECIFIER \*\* Delete references below not required for the project.

1. LBNL WINDOW SOFTWARE - A computer program for calculating total window thermal performance indices (i.e. U-values, solar heat gain coefficients, and visible transmittances).
2. NFRC 100/200 - Standard Methods of Test for Solar Absorbance, Reflectance and Transmittance of Materials Using Integrating Spheres.
3. ASTM E 903 - Standard Methods of Test for Solar Absorbance, Reflectance and Transmittance of Materials Using Integrating Spheres.
4. ASTM D882 - Standard Test Method for Tensile Properties of Thin Plastic Sheeting.
5. ASTM D4830 - Standard Test Methods for Characterizing Thermoplastic Fabrics Used in Roofing and Waterproofing.
6. ASTM D1004 - Standard Test Method for Tear Resistance (Graves Tear) of Plastic Film and Sheeting.
7. ASTM D1044 - Standard Method of Test for Resistance of Transparent Plastics to Surface Abrasion (Taber Abrader Test).
8. ASTM D1003 - Standard Test Method for Haze and Luminous Transmittance of Transparent Plastics
9. ASTM E 84 - Standard Method of Test for Surface Burning Characteristics of Building Materials.
10. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test.
11. Consumer Products Safety Commission (CFR): 16 CFR, Part 1201 - Safety Standard for Architectural Glazing Materials.
12. United States General Services Administration (GSA): GSA-TS01-2003 - Standard Test for Glazing and Glazing Systems Subject to Airblast Loadings.
13. ISO 14025:2006 - Establishes the principles and specifies the procedures for developing Type III environmental declaration programs and Type III environmental declarations.
14. ISO 21930:2017 - Provides the principles, specifications and requirements to develop an environmental product declaration (EPD) for construction products and services, construction elements and integrated technical systems used in any type of construction works.
	1. PERFORMANCE REQUIREMENTS

\*\* NOTE TO SPECIFIER \*\* Delete performance requirements below not required for the project.

* + 1. Safety Glazing Impact Performance:
			1. Meets ANSI Z97.1 Class B and 16 CFR 1201 Category I 150 ft-lbs impact resistance
			2. Meets accelerated weathering requirements in accordance with ANSI Z97.1
		2. Blast Mitigation Performance: Independent test results when tested in accordance with GSA TS01-2003
			1. GSA TS-01-2003, GSA Performance Condition with a minimum blast pressure of 4 psi-28 psi-msec when applied as a daylight application on 1/4 inch (6 mm) single pane annealed glass: 3B.
		3. Flammability: Meets surface burning characteristics in accordance with ASTM E-84 Class A
			1. Flame Spread Index = < 25
			2. Smoke Development Index = < 450
		4. Volatile Organic Compound Content:
			1. Compliant with the performance standard established for low-emitting materials under the CDPH, the Collaborative for High Performance Schools (CHPS) and the LEED v4 programs.
	1. SUBMITTALS

\*\* NOTE TO SPECIFIER \*\* Delete submittals not required for the project.

* + 1. Submit under provisions of Section 01 30 00.
		2. Product Data: Manufacturer's data sheets on each product to be used, including:
			1. Independent accredited testing agency reports showing compliance with specified tests in section 1.3.
			2. Preparation instructions and recommendations.
			3. Storage and handling requirements and recommendations.
			4. Installation methods.
		3. Provide a Film to Glass Stress Analysis of the existing glass and proposed glass/solar film combination as recommended by the film manufacturer.
		4. Provide energy saving simulations report using Efilm energy analyzing software application to determine available energy cost reduction and savings.
		5. Provide third-party verified Environmental Product Declaration (EPD) documentation for all window film products, compliant with ISO 14025 and ISO 21930. The EPD shall be current, publicly available, and included in the submittal package.
		6. Shop Drawings: Detailing installation of film, anchoring accessories, and sealant.
		7. Verification Samples: For each finish product specified, two samples, minimum size 6 inches (150 mm) square, representing actual product, color, and patterns.
		8. Manufacturer's Certificates: Certify products meet or exceed specified requirements.
		9. Manufacturer's warranty information.
	1. QUALITY ASSURANCE
		1. Manufacturer Qualifications: Products specified shall be a standard product of a manufacturer regularly engaged in the manufacturing and distribution of such products for a minimum of 10 years.
			1. Provide a Quality Management certificate stating the manufacturing facility’s location conformance with ISO 9001
			2. Provide an Environmental Management certificate stating the manufacturing facility’s location conformance with ISO 14001
		2. Installer Qualifications: Documented experience in the application of self-adhesive window films with at least 3 applications of similar size and complexity and approved by the window film manufacturer.

\*\* NOTE TO SPECIFIER \*\* Include a mock-up if the project size and/or quality warrant taking such a precaution. The following is one example of how a mock-up on a large project might be specified. When deciding on the extent of the mock-up, consider all the major different types of work on the project.

* + 1. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
			1. Apply film and wet glaze (if required) to one window designated by Architect.
			2. Do not proceed with remaining work until workmanship and color, is approved by Architect.
	1. DELIVERY, STORAGE, AND HANDLING
		1. Store products indoors in manufacturer's unopened packaging until ready for installation.
		2. Dispose of any hazardous materials, and materials contaminated by hazardous materials, in accordance with requirements of local authorities.
	2. PROJECT CONDITIONS
		1. 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.
	3. WARRANTY

\*\* NOTE TO SPECIFIER \*\* Delete the following paragraphs if no warranties are required or if the work is covered under the terms of a general project warranty specified elsewhere.

* + 1. Provide film manufacturer's limited warranty against failure of film, including change of color, peeling, bubbling, rippling, cracking, delamination and demetallization; includes cost of material and labor for removal and reinstallation. Duration of warranty shall be as follows:
			1. Twelve (12) Year Limited Warranty for the following safety and security film products:
				1. Solar Gard Armorcoat 4-mil (100 micron)
1. PRODUCTS
	1. MANUFACTURERS
		1. Acceptable Manufacturer: Solar Gard®, which is located at: 4540 View Ridge Ave. ; San Diego, CA 92123; Toll Free Tel: 866-572-1922; Tel: 858-576-0200; Email:info@solargard.com; Web:[www.solargard.com](http://www.solargard.com)
		2. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00.
	2. SAFETY AND SECURITY FILM

\*\* NOTE TO SPECIFIER \*\* Delete film options from the list below not considered for project.

* + 1. Solar Gard Armorcoat 4-mil (100 micron) Optically clear safety film with pressure sensitive adhesive and abrasive resistant coating shall have the following nominal properties when applied to 1/4 inch (6 mm) clear glass
			1. Film Performance Results, Nominal
				1. Film Color: Clear
				2. Visible Light Transmittance: 88 percent
				3. Visible Light Reflectance: (Exterior) 9 percent
				4. Visible Light Reflectance: (Interior) 9 percent
				5. Total Solar Energy Rejected: 21 percent
				6. Solar Heat Gain Coefficient: .79
				7. U-Factor Btu/h-ft² F (Winter): 1.06
				8. Solar Transmittance: 74 percent
				9. Solar Absorptance: 18 percent
				10. Solar Reflectance: 8 percent
				11. Ultraviolet Light Blocked (300-380 nanometers): > 99 percent
				12. UV Tdw-ISO @ 300 to 700 nm: 63 percent
			2. Film Performance Results when applied to 1/4 inch (6 mm) clear insulated glass (Nominal)
				1. Film color: Clear
				2. Visible Light Transmittance: 79 percent
				3. Visible Light Reflectance: (Exterior) 16 percent
				4. Visible Light Reflectance: (Interior) 16 percent
				5. Total Solar Energy Rejected: 31 percent
				6. Solar Heat Gain Coefficient: .69
				7. U-Factor Btu/h-ft² F (Winter): .48
				8. Solar Transmittance: 58 percent
				9. Solar Absorptance: 30 percent
				10. Solar Reflectance: 12 percent
				11. Ultraviolet Light Blocked (300-380 nanometers): > 99 percent
				12. UV Tdw-ISO @ 300 to 700 nm: 56 percent
		2. Solar Gard Armorcoat 4-mil (100 micron) Silver 20, Optically clear safety film with pressure sensitive adhesive and abrasive resistant coating shall have the following nominal properties when applied to 1/4 inch (6 mm) clear glass
			1. Film Performance Results, Nominal
				1. Film Color: Silver
				2. Visible Light Transmittance: 15 percent
				3. Visible Light Reflectance: (Exterior) 57 percent
				4. Visible Light Reflectance: (Interior) 60 percent
				5. Total Solar Energy Rejected: 77 percent
				6. Solar Heat Gain Coefficient: .23
				7. U-Factor Btu/h-ft² F (Winter): .95
				8. Solar Transmittance: 10 percent
				9. Solar Absorptance: 45 percent
				10. Solar Reflectance: 45 percent
				11. Ultraviolet Light Blocked (300-380 nanometers): > 99 percent
				12. UV Tdw-ISO @ 300 to 700 nm: 13 percent
			2. Film Performance Results when applied to 1/4 inch (6 mm) clear insulated glass (Nominal)
				1. Film color: Silver
				2. Visible Light Transmittance: 14 percent
				3. Visible Light Reflectance: (Exterior) 56 percent
				4. Visible Light Reflectance: (Interior) 60 percent
				5. Total Solar Energy Rejected: 67 percent
				6. Solar Heat Gain Coefficient: .33
				7. U-Factor Btu/h-ft² F (Winter): .45
				8. Solar Transmittance: 8 percent
				9. Solar Absorptance: 55 percent
				10. Solar Reflectance: 37 percent
				11. Ultraviolet Light Blocked (300-380 nanometers): > 99 percent
				12. UV Tdw-ISO @ 300 to 700 nm: 12 percent
		3. Solar Gard Armorcoat 4-mil (100 micron) Stainless Steel 20, Optically clear safety film with pressure sensitive adhesive and abrasive resistant coating shall have the following nominal properties when applied to 1/4 inch (6 mm) clear glass
			1. Film Performance Results, Nominal
				1. Film Color: Grey
				2. Visible Light Transmittance: 46 percent
				3. Visible Light Reflectance: (Exterior) 13 percent
				4. Visible Light Reflectance: (Interior) 11 percent
				5. Total Solar Energy Rejected: 45 percent
				6. Solar Heat Gain Coefficient: .55
				7. U-Factor Btu/h-ft² F (Winter): 1.05
				8. Solar Transmittance: 39 percent
				9. Solar Absorptance: 50 percent
				10. Solar Reflectance: 11 percent
				11. Ultraviolet Light Blocked (300-380 nanometers): > 99 percent
				12. UV Tdw-ISO @ 300 to 700 nm: 33 percent
			2. Film Performance Results when applied to 1/4 inch (6 mm) clear insulated glass (Nominal)
				1. Film color: Grey
				2. Visible Light Transmittance: 41 percent
				3. Visible Light Reflectance: (Exterior) 19 percent
				4. Visible Light Reflectance: (Interior) 13 percent
				5. Total Solar Energy Rejected: 42 percent
				6. Solar Heat Gain Coefficient: .58
				7. U-Factor Btu/h-ft² F (Winter): .48
				8. Solar Transmittance: 31 percent
				9. Solar Absorptance: 55 percent
				10. Solar Reflectance: 14 percent
				11. Ultraviolet Light Blocked (300-380 nanometers): > 99 percent
				12. UV Tdw-ISO @ 300 to 700 nm: 29 percent
		4. Solar Gard Armorcoat 4-mil (100 micron) Stainless Steel 35. Optically clear safety film with pressure sensitive adhesive and abrasive resistant coating shall have the following nominal properties when applied to 1/4 inch (6 mm) clear glass
			1. Film Performance Results, Nominal
				1. Film Color: Grey
				2. Visible Light Transmittance: 37 percent
				3. Visible Light Reflectance: (Exterior) 17 percent
				4. Visible Light Reflectance: (Interior) 15 percent
				5. Total Solar Energy Rejected: 50 percent
				6. Solar Heat Gain Coefficient: .50
				7. U-Factor Btu/h-ft² F (Winter): 1.04
				8. Solar Transmittance: 32 percent
				9. Solar Absorptance: 55 percent
				10. Solar Reflectance: 13 percent
				11. Ultraviolet Light Blocked (300-380 nanometers): > 99 percent
				12. UV Tdw-ISO @ 300 to 700 nm: 26 percent
			2. Film Performance Results when applied to 1/4 inch (6 mm) clear insulated glass (Nominal)
				1. Film color: Grey
				2. Visible Light Transmittance: 33 percent
				3. Visible Light Reflectance: (Exterior) 22 percent
				4. Visible Light Reflectance: (Interior) 17 percent
				5. Total Solar Energy Rejected: 45 percent
				6. Solar Heat Gain Coefficient: .55
				7. U-Factor Btu/h-ft² F (Winter): .48
				8. Solar Transmittance: 26 percent
				9. Solar Absorptance: 58 percent
				10. Solar Reflectance: 16 percent
				11. Ultraviolet Light Blocked (300-380 nanometers): > 99 percent
				12. UV Tdw-ISO @ 300 to 700 nm: 23 percent
		5. Solar Gard Armorcoat 4-mil (100 micron) Stainless Steel 20, Optically clear safety film with pressure sensitive adhesive and abrasive resistant coating shall have the following nominal properties when applied to 1/4 inch (6 mm) clear glass
			1. Film Performance Results, Nominal
				1. Film Color: Grey
				2. Visible Light Transmittance: 22 percent
				3. Visible Light Reflectance: (Exterior) 27 percent
				4. Visible Light Reflectance: (Interior) 25 percent
				5. Total Solar Energy Rejected: 62 percent
				6. Solar Heat Gain Coefficient: .38
				7. U-Factor Btu/h-ft² F (Winter): 1.03
				8. Solar Transmittance: 19 percent
				9. Solar Absorptance: 60 percent
				10. Solar Reflectance: 21 percent
				11. Ultraviolet Light Blocked (300-380 nanometers): > 99 percent
				12. UV Tdw-ISO @ 300 to 700 nm: 16 percent
			2. Film Performance Results when applied to 1/4 inch (6 mm) clear insulated glass (Nominal)
				1. Film color: Grey
				2. Visible Light Transmittance: 20 percent
				3. Visible Light Reflectance: (Exterior) 30 percent
				4. Visible Light Reflectance: (Interior) 25 percent
				5. Total Solar Energy Rejected: 52 percent
				6. Solar Heat Gain Coefficient: .48
				7. U-Factor Btu/h-ft² F (Winter): .47
				8. Solar Transmittance: 15 percent
				9. Solar Absorptance: 64 percent
				10. Solar Reflectance: 21 percent
				11. Ultraviolet Light Blocked (300-380 nanometers): > 99 percent
				12. UV Tdw-ISO @ 300 to 700 nm: 14 percent
			3. Physical Properties, Nominal

\*\* NOTE TO SPECIFIER \*\* The following values are nominal and should NOT be used for specification purposes. Material physical properties testing is conducted in a lab setting under controlled parameters. Performance testing on filmed glass is preferred and indicative of real world applications. There are specific industry standards that demonstrate a safety films performance when applied to glass. Refer to Section 1.3 when specifying safety film performance requirements.

* + - * 1. Film Thickness: 4-mil (100 micron)
				2. Peel Strength: >2500 g/in (985 gm./cm).
				3. ASTM D-1003 Abrasion Resistance: < 5%
1. EXECUTION
	1. EXAMINATION
		1. If the substrate preparation is the responsibility of another installer, notify the Architect or Project Leader of unsatisfactory preparation before proceeding.
		2. Glass surfaces should be inspected for defects including scratches or defects which will affect the final appearance.
		3. Do not begin installation until substrates have been properly prepared.
		4. If substrate preparation is the responsibility of another installer, notify Architect or Project Leader of unsatisfactory preparation before proceeding.
		5. If the application of a wet glaze attachment system is required, verify that the window film installation has met the manufacturers recommended guidelines and has passed visual inspection by the Architect or Project Leader.
			1. An adhesion test may be conducted to the frame surface to verify compatibility. Adhesion test typically involves the application of a 1-inch-wide by 6-inch-length bead. Bead is allowed to cure for a minimum 7 days. The applied bead is removed at a 90-degree angle. The result should be cohesive failure meaning a portion of the product remains on the surface. If adhesion fails, seek the advice of the manufacturer.
	2. PREPARATION
		1. Clean surfaces thoroughly prior to installation.
		2. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
		3. If the application of a wet glaze attachment system is required, refer to manufacturers instruction for surface preparation.
	3. FILM INSTALLATION
		1. Install in accordance with manufacturer's instructions. Installation must be accomplished by a recognized professional installer of film for solar control or safety and security purposes. Completed work must meet IWFA visual acceptance standard.
		2. Install without bubbles, ripples, drips, dirt, cuts, tears or gaps between film and frame.
		3. Clean newly installed film and window frames after installation.
		4. Clean up cleaning solutions, run-off cleaning water and adhesive mounting solution.
	4. WET GLAZE INSTALLATION
		1. The wet glaze attachment system shall be applied according to the guidelines of the Manufacturer by an Authorized Dealer/Applicator. For guidance on the installation of wet glaze attachments, please review Solar Gard tech bulletin document PDF0258.
		2. For blast mitigation purposes, a minimum 1/2-inch overlap on film and frame (excluding glazing stops) or 3/8-inch depth at bead center.
		3. For impact resistance or glass retention purposes, a minimum 3/8-inch overlap on film and frame (excluding glazing stops) or 1/4-inch depth at bead center.
		4. Open cell backer rod may be used to fill the void when gaskets are removed. Alternatively, existing gaskets may be cut back with Architect or Project Leader approval. For this application, it is recommended to perform a compatibility test with the wet glaze. This can be requested through the manufacture of the wet glaze product.
		5. In some instances, the area to be wet glazed may be masked and a tooling knife used to smooth the applied bead to required size. To maximize bead depth, the applied bead should have a triangular profile shape. A concave shape bead may be acceptable with proper bead depth at center based on requirements. All tapes used to mask the area should be removed within the working time of the sealant outlined in the product data sheet.
	5. PROTECTION
		1. Protect installed products until completion of project.
		2. Where installed film could be damaged by subsequent construction provide tape warning strips or barricades to prevent contact.

END OF SECTION