

SECTION 08 87 23

WINDOW FILMS

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\*\* NOTE TO SPECIFIER \*\* Madico®, Inc.; Commercial and residential solar control and safety films.
This section is based on the products of Madico®, Inc., which is located at:
9251 Belcher Rd. N.
Pinellas Park, FL 33782
Toll Free Tel: 888-887-2022
Tel: 727-327-2544
Email:[request info (contact@madico.com)](http://admin.arcat.com/users.pl?action=UserEmail&company=Madico26reg+Inc&coid=33948&rep=&fax=&message=RE:%20Spec%20Question%20(08870mad):%20%20&mf=)
Web:<http://www.madico.com/window-film>|<http://www.safetyshield.com/products/>
[[Click Here](http://www.arcat.com/arcatcos/cos33/arc33948.html)] for additional information.
Madico, Inc. innovates, manufactures and distributes a broad range of materials-based solutions including window films, coatings and laminates for numerous industries across the globe from automotive and architecture to healthcare and aerospace. Since 1903, Madico has pioneered products with an unrivaled commitment to quality.
An award-winning organization, Madico is a company that puts customers first by embracing a flexible, collaborative manufacturing style that nurtures new customers and strengthens experienced ones. The company's business segments include specialty film, window film and diversified business.
The Window Films division develops advanced laminates that help automobile, home, and commercial property owners curb energy consumption, combat harmful effects of ultraviolet rays, and increase personal safety.

1. GENERAL
	1. SECTION INCLUDES

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

Madico, Inc. manufactures several types of polyester, transparent glazing films that can be either factory or field applied to glazed doors, sidelights, transoms, windows, and curtain walls to mitigate damage to glass from vandals. Graffiti Free films act as a sacrificial barrier to help control vandalism and provide a.

cost-effective alternative to replacing damaged glazing. Graffiti Free films are easily installed and.

replaced so your glass will always look its best. Most effective in transit systems and other high traffic public areas, Graffiti Free is the solution to keeping vandals at bay.

* + 1. Anti-Graffiti Films: Transparent film applied to glass to prevent damage to glass from vandalism by providing a replaceable layer of protection. Graffiti Free is optically clear and can be used on the exterior or interior surface of glass.
			1. Graffiti Free 600 PS SR
	1. RELATED SECTIONS

\*\* NOTE TO SPECIFIER \*\* Delete any sections below not relevant to this project; add others as required.

* + 1. Section 08 40 00 - Entrances, Storefronts, and Curtain Walls.
		2. Section 08 50 00 - Windows.
		3. Section 08 60 00 - Roof Windows and Skylights.
		4. Section 08 83 13 - Mirrored Glass Glazing.
	1. REFERENCES

\*\* NOTE TO SPECIFIER \*\* Delete references from the list below that are not actually required by the text of the edited section.

* + 1. American National Standards Institute (ANSI):
			1. ANSI/NFRC 100 - 2014 - Procedure for Determining Fenestration Product U-factors.
			2. ANSI/NFRC 200 - 2014 - Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence.
			3. ANSI Z26.1 - Safety Glazing Materials for Glazing Motor Vehicles and Motor Vehicle Equipment Operating on Land Highways.
			4. ANSI Z97.1 - Safety Glazing Materials Used In Buildings - Safety Performance Specifications and Methods of Test.
		2. Lawrence Berkeley National Laboratory:
			1. WINDOW 7.4 - Computer program used to model, analyze products made from any combination of glazing layers, gas layers, frames, spacers, and dividers under any environmental conditions and at any tilt.
		3. Consumer Products Safety Council (CPSC):
			1. CPSC Part 1201 - Safety Standard for Architectural Glazing Materials.
		4. International Window Film Association (IWFA):
			1. Architectural Visual Inspection Standard For Applied Window Film As Adopted By The IWFA May 15, 1999.
		5. ASTM International (ASTM):
			1. ASTM D882 - Standard Test Method for Tensile Properties of Thin Plastic Sheeting.
			2. ASTM D1044 - Standard Test Method for Resistance of Transparent Plastics to Surface Abrasion.
			3. ASTM D2582 - Standard Test Method for Puncture-Propagation Tear Resistance of Plastic Film and Thin Sheeting.
			4. ASTM D3330 - Standard Test Method for Peel Adhesion at 180 Degree Angle.
			5. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
			6. ASTM E162 - Standard Test Method for Surface Flammability of Materials Using a Radiant Heat Energy Source.
			7. ASTM E662 - Standard Test Method for Specific Optical Density of Smoke Generated by Solid Materials.
			8. ASTM E903 - Standard Test Method for Solar Absorptance, Reflectance, and Transmittance of Materials Using Integrating Spheres.
			9. ASTM E1354 - Standard Test Method for Heat and Visible Smoke Release Rates for Materials and Products Using an Oxygen Consumption Calorimeter.
		6. Bombardier SMP 800-C - Toxic Gas Generation from Material Combustion.
		7. Code of Federal Regulation (CFR):
			1. Title 49 - Chapter II - Federal Railroad Administration, Department of Transportation, Part 238 - Equipment Safety Standards, Appendix B to Part 238 - Test Methods and Performance Criteria for the Flammability and Smoke Emission Characteristics of Materials used in Passenger Cars and Locomotive Cabs.
			2. Title 49- Chapter V - Federal Motor Vehicle Safety Standards (FMVSS) No. 205, Glazing Materials (49 CFR 571.205).
		8. National Fire Protection Association - NFPA 130 - Standard for Fixed Guideway Transit and Passenger Rail Systems.
		9. National Association of State Fire Marshals - Recommended Fire Safety Practices for Rail Transit Materials Selection, Prepared for the U.S. Deparent of Transportation Federal Transit Administration Office of Safety and Security Technical Assistance Program, November 2008.
	1. PERFORMANCE REQUIREMENTS
		1. Flammability (performance to ASTM E84):
			1. Flammability: Surface burning characteristics when tested in accordance ASTM E 84:
				1. Flame Spread Index: 25, maximum.
				2. Smoke Developed Index: 450, maximum.
		2. Abrasion resistance (performance to ASTM D1044):
			1. Abrasion Resistance: Film must 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 D 1044 using 50 cycles, 500 grams weight, and the CS10F Calibrase Wheel.

\*\* NOTE TO SPECIFIER \*\* Delete if not required.

* + 1. ANSI Z26.1: Films shall meet or exceed the required results of the following ANSI Z26.1 tests:
			1. Test 1 - Light Stability - The regular (parallel) luminous transmittance of the exposed specimens shall be reduced no more than 5 percent.
			2. Test 2 - Luminous Transmittance - Specimens shall exhibit regular (parallel) luminous transmittance of not less than 70 percent of the light, at normal incidence, both before and after irradiation.
			3. Test 3 - Humidity - No separation of materials shall develop, except for occasional small spots, not one of which shall extend inward from the edge to a depth of more than 6.35 mm (1/4").
			4. Test 9 - Impact (Dart, 30') - The hole so produced in the specimens shall not be sufficiently large to permit the passage of the dart's body completely through the specimen.
			5. Test 12 - Impact (Ball, 30') - Not more than two of the specimens shall break into separate large pieces, nor shall more than two of the remaining specimens develop a fracture or hole at any location in the specimen through which the ball would pass.
			6. Test 15 - Optical Deviation and Visibility Distortion - Optical Deviation: There shall be no shift of the secondary image beyond the point of tangency with the inside edge of the circle. Optical Distortion: No light and dark patches, existent over the entire area, shall appear in the shadow of the unmasked area of the specimen before the specimen shall have been moved a distance of at least 635 mm (25 in.) from the screen.
			7. Test 17 - Abrasion - The arithmetic mean of the percentages of light scattered by the three specimens as a result of abrasion shall not exceed 15.0 percent.
			8. Test 19 - Chemical Resistance - There shall be no tackiness, crazing or apparent loss of transparency in the samples.
			9. Test 24 - Flammability - The horizontal burning rate shall not exceed 1.48 mm/s (3.5 in/min).
			10. Test 28 - Temperature Change - Specimens shall show no evidence of cracking, clouding, delaminating, or other evidence of deterioration.

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* + 1. Smoke Density and Flame Spread: Film shall meet the Optical Density and Flame Spread Index when tested in accordance with NFPA 130 and 49 CFR Part 238 (ASTM E162 and ASTM E662):
			1. ASTM E162: Flame Spread Index.
				1. Is Flame Spread Index; Is less than or equal to 100.
				2. Drips Flame on Test Floor; None.
			2. ASTM E662: Optical Density: Both Flaming and Non-Flaming Modes.
				1. Ds 1.5 Specific optical density at 1.5 minutes; Ds 1.55 less than or equal to 100.
				2. Ds 4.0 Specific optical density at 4.0 minutes; Ds 4.0 less than or equal to 200.

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* + 1. Toxic Gas Generation: Films shall meet or exceed the required results of Bombardier SMP 800-C tested in both Flaming and Non-Flaming Modes:
			1. Carbon Monoxide (CO) less than or equal to 3,500 ppm.
			2. Carbon Dioxide (CO2) less than or equal to 90,000 ppm.
			3. Nitrogen Dioxide (NO2) less than or equal to 100 ppm.
			4. Sulfur Dioxide (SO2) less than or equal to 100 ppm.
			5. Hydrogen Chloride (HCl) less than or equal to 500 ppm.
			6. Hydrogen Fluoride (HF) less than or equal to 100 ppm.
			7. Hydrogen Bromide (HBr) less than or equal to 100 ppm.
			8. Hydrogen Cyanide (HCN) less than or equal to 100 ppm.
	1. SUBMITTALS
		1. Submit under provisions of Section 01 30 00 - Administrative Requirements.
		2. Product Data:
			1. Manufacturer's data sheets on each product to be used.
			2. Preparation instructions and recommendations.
			3. Storage and handling requirements and recommendations.
			4. Typical installation methods.
		3. Verification Samples: 4 inches by 6 inches (102 mm by 152 mm) minimum sample of glazing film.
		4. Shop Drawings: Include details of materials, construction and finish. Include relationship with adjacent construction.
		5. Madico, Inc. SafetyShield Window Film Green / LEED credit data that can contribute LEED credits to a building project's LEED certification.
		6. Sustainability Submittals: Refer to Division 01 for requirements regarding VOC limits, recycled content, regional materials, and required documentation.
	2. QUALITY ASSURANCE
		1. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with a minimum ten years successful documented experience.
		2. Installer Qualifications:
			1. Installer: Glazing film shall be applied by installers with a minimum of five years successful experience installing products of the same type and scope as specified.
			2. Provide documentation that the installer is certified by glazing film manufacturer to perform the work specified.
			3. Provide references of three projects where the installer has applied safety and security film or similar nature and size. The list should include:
				1. Name of building.
				2. The name and telephone number of project manager.
				3. Type of glass.
				4. Type of film and attachment system.
				5. Amount of film and attachment system installed.
				6. Date of completion.
		3. Source Limitations: Provide each type of product from a single manufacturing source to ensure uniformity.
		4. USGBC LEED Program:
			1. Product shall contribute to LEED 2009 or LEED V4 credits as applicable, (www.usgbc.org).
			2. Indoor Environmental Quality:
				1. Low-emitting paints.
				2. Daylight and views - daylight.
				3. Daylight and views - views.

\*\* NOTE TO SPECIFIER \*\* Include mock-up if the project size or quality warrant the expense. The following is one example of how a mock-up on might be specified. When deciding on the extent of the mock-up, consider all the major different types of work on the project. Delete if not required.

* + 1. Mock-Up: Construct a mock-up with actual materials in sufficient time for Architect's review and to not delay construction progress. Locate mock-up as acceptable to Architect and provide temporary foundations and support.
			1. Intent of mock-up is to demonstrate quality of workmanship and visual appearance.
			2. If mock-up is not acceptable, rebuild mock-up until satisfactory results are achieved.
			3. Retain mock-up during construction as a standard for comparison with completed work.
			4. Do not alter or remove mock-up until work is completed or removal is authorized.
	1. PRE-INSTALLATION CONFERENCE
		1. Convene a conference approximately two weeks before scheduled commencement of the Work. Attendees shall include Architect, Contractor and trades involved. Agenda shall include schedule, responsibilities, critical path items and approvals.
	2. DELIVERY, STORAGE, AND HANDLING
		1. Store and handle in strict compliance with manufacturer's written instructions and recommendations.
		2. Protect from damage due to weather, excessive temperature, and construction operations.
	3. 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 recommended limits.
		2. Surface temperature: Do not apply glazing film when surface temperature is less than 40 degrees Fahrenheit.
		3. Prior to installation, the glass and frames shall be inspected for surface contamination, damage, or other defects that may adversely affect the performance of the glazing film.
	4. SEQUENCING
		1. Ensure that products of this section are supplied to affected trades in time to prevent interruption of construction progress.
	5. WARRANTY
		1. Manufacturer's Warranty: Provide manufacturer's standard limited warranty.
1. PRODUCTS
	1. MANUFACTURERS
		1. Acceptable Manufacturer: Madico®, Inc., which is located at: 9251 Belcher Rd. N.; Pinellas Park, FL 33782; Toll Free Tel: 888-887-2022; Tel: 727-327-2544; Email:[request info (contact@madico.com)](http://admin.arcat.com/users.pl?action=UserEmail&company=Madico26reg+Inc&coid=33948&rep=&fax=&message=RE:%20Spec%20Question%20(08870mad):%20%20&mf=); Web:<http://www.madico.com/window-film>|<http://www.safetyshield.com/products/>
		2. Email: windowfilm@madico.com; Web: www.madico.com.
		3. Substitutions: Not permitted.

\*\* NOTE TO SPECIFIER \*\* Delete if not required.

* 1. SAFETY AND SECURITY FILMS

\*\* NOTE TO SPECIFIER \*\* Vandalism is more than just a nuisance and eyesore; it's also a huge financial drain to public and private budgets. The cost of repeatedly replacing windows and glass that has been scratched up or marked with spray-paint can end up being prohibitive, not to mention time consuming and disruptive.

Graffiti-Free is Madico's window coating for the commercial and retail marketplace. When vandals do strike, it won't be permanent. The window stays put, and just the film is replaced, at a fraction of the cost. Graffiti-Free can also be used on many non-porous surfaces other than glass. Delete if not required.

\*\* NOTE TO SPECIFIER \*\* Graffiti-Free film is designed to protect both glass and other smooth surfaces from harm. Optically clear and distortion-free, Graffiti-Free window film acts a sacrificial barrier to guard glass from costly graffiti, etching, or high-traffic wear. After such an event has occurred, the damaged film is removed and a new layer is installed at a cost significantly less than the cost of removing and replacing the glass. Delete if not required.

* + 1. Graffiti Mitigation:
			1. Type: Transparent, polyester, sacrificial protective film bonded to glass to prevent damage to glass from vandalism by providing a replaceable layer of protection. Made up from three (3) layers of Polyethylene Terephthalate (PET) film, each layer being 2 mil thick, laminated together with an optically clear acrylic adhesive. Single ply 6 mil thick and double ply 6 mil thick films are NOT acceptable; Graffiti Free 600 PS SR as manufactured by Madico, Inc.
				1. Physical Properties.

Thickness: 0.006 inch.

Color: Clear.

Construction: Three-ply.

Adhesive type: Pressure sensitive acrylic.

Tensile strength: 25,000 PSI tested in accordance with ASTM D882.

Breaking strength: 150 pounds per inch minimum tested in accordance with ASTM D882.

Peel strength: 3 pounds per inch minimum tested in accordance with ASTM D3330.

Surface burning characteristics tested in accordance with ASTM E84: Class A.

Flame spread: 0 to 25 maximum.

Smoke development: 0 to 450 maximum.

* + - * 1. Performance attributes for film applied to 1/4 inch (6 mm) thick clear glass tested in accordance with ANSI/NFRC 100 and ANSI/NFRC 200:

Visible Light:

Transmittance: 87 percent.

Reflected: 10 percent.

Glare reduction: 3 percent.

Ultra violet light transmittance: less than 1 percent.

U-value: 1.02.

Solar energy:

Transmittance: 76 percent.

Reflected: 9 percent.

Absorbed: 15 percent.

Shading Coefficient (SC): 0.93.

Solar Heat Gain Coefficient (SHGC): 0.81.

Emissivity: 0.84.

1. EXECUTION
	1. GLAZING FILM APPLICATION
		1. Field apply glazing film to the following items in accordance with manufacturer's instructions:
			1. Steel framed glazed doors, sidelights, transoms, and windows.
			2. Aluminum framed glazed doors, sidelights, transoms, and windows.
			3. Aluminum curtain wall framing system.
			4. Other curtain wall framing system.
			5. Manufactured wood windows.
			6. Manufactured steel windows.
			7. Manufactured aluminum windows.
			8. Manufactured windows.
		2. Do not apply glazing film when surface temperature is less than 40 degrees F (4 degrees C).
		3. Inspection:
			1. Examine glass and frames. Verify that existing conditions are adequate for proper application and performance of film.
			2. Verify glass is not cracked, chipped, broken, or damaged.
			3. Verify that frames are securely anchored and free of defects.
			4. Do not proceed until unsatisfactory conditions have been addressed.
	2. PREPARATION
		* 1. Comply with manufacturers recommendations for surface preparation.
			2. Clean glass of dust, dirt, paint, oil, grease, mildew, mold, and other contaminants that would inhibit adhesion.
			3. Immediately prior to applying film, thoroughly wash glass with neutral cleaning solution.
			4. Protect adjacent surfaces.
	3. INSTALATION
		1. General Film Installation:
			1. Install in accordance with manufacturers written instructions and approved shop drawings.
			2. Accurately cut film with straight edges to required sizes allowing 1/16 to 1/8 inch (2 to 3 mm) gap at perimeter of glazed panel.
			3. Remove release liner immediately prior to adhering film to glass.
			4. Apply mounting solution to film and glass.
			5. Apply film to glass and removed air bubbles, wrinkles, and other defects using a squeegee. Three to five complete passes are required to completely remove mounting solution from between film and glass.
	4. FIELD QUALITY CONTROL
		1. After installation, view film from a distance of 10 feet (3 meters) against a light colored background. Ensure appearance is uniform without streaks, bands, thin spots, and pinholes in accordance with the IWFA Architectural Visual Inspection Standard for Applied Window Film as Adopted by the IWFA May 15,1999.
		2. If installed film does not meet these requirements removed and replaced with new film.
	5. CLEANING AND PROTECTION
		1. Inspect installation. Verify that it is complete and complies with requirements and manufacturer's instructions to provide specified anti-intrusion requirements. Correct deficiencies.
		2. Clean glass following installation. Remove excess sealants and other glazing materials from adjacent finished surfaces.
		3. Remove labels and protective covers.

END OF SECTION