Section 08870
WINDOW FILM

** NOTE TO SPECIFIER ** SerraGlaze® Daylight Redirecting Window Films

This section is based on the products of SerraLux Inc., which is located at:
6025 Labath Avenue, Rohnert Park, CA 94928.
Tel: 408.355.3557
Web: www.SerraLuxInc.com/serraglaze-performance-info

SerraLux creates the finest daylight enhancing products available for offices, schools, healthcare facilities, manufacturing plants, warehouses and homes. Our SerraGlaze Daylight Redirecting films provide an elegant means for solving many of the most challenging aspects of managing daylight use and controlling glare in your business or home. Our film reduces glare and redirects daylight to increase occupant comfort and overall energy efficiency. SerraGlaze – glare control and daylight enhancement while preserving the view out of the window.

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Daylight redirecting film. (Micro-Replicated)

1.2 RELATED SECTIONS

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

A. Section 08500 - Windows; windows to receive architectural window film.

B. Section 08600 - Skylights; glass skylights to receive architectural window film.

C. Section 08800 - Glazing; general glazing applications to receive architectural window film. 08870-2

D. Section 08900 - Glazed Curtain Walls; curtain walls to receive architectural window film.

1.3 REFERENCES

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

A. ASHRAE - American Society for Heating, Refrigeration, and Air Conditioning Engineers; Handbook of Fundamentals.

B. ASTM International (ASTM):

1. ASTM D 1003 - Standard Test Method for Haze and Luminous Transmittance of Transparent Plastics

2. ASTM E 313 - Standard Practice for Calculating Yellowness and Whiteness Indices from Instrumentally Measured Color Coordinates

3. ASTM E 2188 - Standard Test Method for Insulating Glass Unit Performance

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

C. Window 6.3 - A Computer Tool for Analyzing Window Thermal Performance; Lawrence Berkeley Laboratory.

D. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings -Safety Performance Specifications and Methods of Test.

E. IES LM-83-12: IES Spatial Daylight Autonomy (sDA) and Annual Sunlight Exposure.

F. GSA-TS01 - Standard Test for Glazing and Glazing Systems Subject to Airblast Loadings.

1.4 PERFORMANCE REQUIREMENTS

A. Must enhance the penetration of usable daylight within the space

B. Must preserve the view through the window (applicable to SerraGlaze Select)

C. Must reduce the glare through the window

1.5 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Product Data: Manufacturer's data sheets on each product to be used, including:

1. Preparation instructions and recommendations.

2. Storage and handling requirements and recommendations.

3. Installation methods.

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

C. Verification Samples: For each film specified, two samples representing actual film clarity and pattern.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: All primary products specified in this section will be supplied by a single manufacturer with a minimum of five years' experience.

** NOTE TO SPECIFIER **Pressure Sensitive Adhesives (PSA) physically bond to the glass, allowing for the film to be removed at the end of life. Clear Dry Adhesives (CDA) chemically bond to the glass. These may require the use of toxic chemicals to remove, or the complete replacement of the existing glass, significantly increasing end of life costs.

1. Provide documentation that the adhesive used on the specified films is a Pressure Sensitive Adhesive (PSA).

B. Installer Qualifications: 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 a similar thickness and scope as specified.

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

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

2. Provide a commercial building reference list of 5 properties where the installer has applied window film. This list will include the following information:

a. Name of building.

b. The name and telephone number of a management contact.

c. Type of glass.

d. Type of film.

e. Amount of film installed.

f. Date of completion.

** 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.

C. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.

1. Install film in mockup areas designated by Architect.

2. Do not proceed with remaining work until workmanship, color, and sheen are approved by Architect.

3. Refinish mock-up area as required to produce acceptable work.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store at 50º to 85º Fahrenheit and 40 to 80% Relative Humidity (RH). Store in original packaging until ready for installation. Do not stack heavy items on top of SerraGlaze while being stored flat.

B. Store product in a semi-controlled environment—free from contaminants and temperature fluctuations

C. Store and dispose of hazardous materials, and materials contaminated by hazardous materials, in accordance with requirements of local authorities having jurisdiction.

D. Shelf life is 360 days.

1.8 PROJECT CONDITIONS

A. 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.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer: SerraLux Inc., which is located at:
6025 Labath Avenue, Rohnert Park, CA 94928; Tel: 408-355-3557;
Email:info@serraluxinc.com; Web: www.SerraLuxInc.com/serraglaze-performance-info

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

2.2 MICRO-REPLICATED DAYLIGHT DIRECTING FILM

A. SerraGlaze is a unique daylight redirecting film. Unlike most window films which are dyed or coated, SerraGlaze is a mechanically microstructured film. Due to the mechanical microstructure process, small imperfections are to be expected.

SerraGlaze is installed above eye level on the interior surface of the window (side 4 on a dual glazed window, side 6 on a triple glazed window). However, as it is designed to be installed above eye level and typically would not be viewed from a distance of less than six feet, these manufacturing imperfections do not adversely impact daylight redirection, glare reduction, and visibility through SerraGlaze.

The number of variables associated with effective daylighting requires a range of products that best meets the needs of the customer and the unique aspects of the building. Using the microstructured Daylight Redirecting Film as the foundation, SerraGlaze is available in two types of coatings to provide a solution that best meets the needs of the customer and facility. These coatings enable a solution that balances the trade-offs of effective daylighting, view through the window, and glare reduction. SerraLux is the only supplier of a range of window film solutions to provide the optimum amount of beneficial daylighting.

The SerraGlaze Select series of daylight redirecting films preserve the view while tuning the amount of daylight admitted to best meet the needs of the occupants and facility. SerraGlaze Select appears as a frit coating and comes in visible light transmissions of 80%, 70%, 60% and 50%. Although every building is different, generally, SerraGlaze Select 80 or 70 would be applied in directly north or south orientations. SerraGlaze Select 50 or 60 would generally be applied in east or west orientations. The key advantage of

SerraGlaze Select is the ability to tune the admitted daylight to the needs of the space and effectively redirecting the admitted daylight deeper into the space while preserving the view out of the window.

The SerraGlaze D (Diffuse) daylight redirecting film is designed for applications that do not need to preserve the view, but still want to manage the glare at the window and introduce more beneficial daylight redirected deeper into the space. Generally, SerraGlaze D would be applied in spaces where privacy is important or in windows that are designed for admission of sunlight but not for viewing, such as in high windows. SerraGlaze D is available as D-4, having a diffusion angle of ±4 degrees for a total diffusion of 8 degrees. The SerraGlaze D film softens the redirected light by diffusing it, but will also reduce the ability to see the detail of objects through the window.

B. Physical Properties:

1. Composition: Optically clear film with microstructure on one surface adhered to a pressure sensitive adhesive ("PSA").

   a. Film color: optically clear.
   b. The microstructured film is comprised of a PET substrate with a structured and cured acrylate resin
   c. Thickness: Total product thickness of 15 mils (0.375 mm), with the microstructured film having a nominal thickness of 12.0 mils (0.300 mm) plus the PSA having a nominal thickness of 3.0 mils (0.075 mm).

2. Uniformity: No noticeable pin holes, streaks, thin spots, scratches, banding or other optical defects.

3. Variation in Total Transmission across the Width: Less than 2 percent over the average at any portion along the length.

4. Identification: Labeled as to Manufacturer as listed in this Section.

C. SerraGlaze Performance Properties as applied to 1/8 Inch (6.4 mm) Thick Clear Glass. Other than Visible Light Redirection, data is based on testing of SerraGlaze. However, results will be similar for SerraGlaze Select and SerraGlaze D (Diffuse):

1. SerraGlaze Visible Light Transmission ("VLT") will be as below, ± 3%, as adhered to existing window and as measured with an integrating sphere and. The Visible Light

Transmissions below can be used to calculate the approximate total window VLT by multiplying the SerraGlaze VLT times the window/IGU VLT.

SerraGlaze Select 80 (Normal Incidence): 80%.

SerraGlaze Select 70 (Normal Incidence): 70%.

SerraGlaze Select 60 (Normal Incidence): 60%.

SerraGlaze Select 50 (Normal Incidence): 50%.

SerraGlaze D-4 (Normal Incidence): 80%

2. Solar Heat Gain Coefficient (Normal Incidence): > 0.80.
3. Yellowness Index (ASTM E 313): 7.13average.
4. Whiteness Index (ASTM E 313): 49.99 average
5. Tint (ASTM E 313): 2.70 average.
6. Haze (ASTM D 1003): 36.16 average

PART 3 EXECUTION

3.1 EXAMINATION

A. Glass Examination:

1. If preparation of glass surfaces is the responsibility of another installer, notify Architect in writing of deviations from manufacturer's recommended installation tolerances and conditions.
    a. Glass surfaces receiving new film should first be examined to verify that they do not have a window film product already installed and are free from defects and imperfections, which will affect the final appearance. Installing film over existing window film will void the Warranty.
    b. It is strongly recommended that any existing film be removed prior to installing film.
2. Do not proceed with installation until glass surfaces have been properly prepared and deviations from manufacturer's recommended

tolerances are corrected. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result under the project conditions.

3. Commencement of installation constitutes acceptance of conditions.

B. Film Examination

1. Packaging should be inspected for any damage and, if the packaging is damaged, should be opened and inspected for any film damage.

2. It is recommended that the film to be laid flat for a period of 24 hours in a space within the range of the manufacturer's specified installation temperature (67⁰ to 82⁰F). Failure to lay flat will make it more difficult to install and could possibly result in permanent unsightly creasing of the film.

3.2 PREPARATION

Please read all installation instructions prior to ordering and again prior to installation for the best quality results and fastest installation. Determine the perimeter treatment method before measuring the window.

SerraGlaze is shipped in finished window panel form to the desired window size, so with accurate measurements, no trimming is necessary. Wear powder-free gloves during installation so as to not leave finger prints and to protect fingers from film cuts.

When ordering the film, provide accurate measurements of each window surface to be filmed (width and then height). Measurements should be: 1) frame-to-frame; or 2) gasket (seal)-to-gasket and clearly noted. Methods of perimeter treatment after the adhesive has cured should also be noted (see "Step 4 - Perimeter Treatment" below).

If a final field cut is desired upon installation as a way to deal with slightly different window sizes, the film can be oversized for a group of windows (the same sized windows within up to 1" in width and height) and can be trimmed in the field on a flat surface (such as a table) with a straight edge prior to applying to window surface. Cutting the film on the window may score the glass and cause future glass breakage; and will void the SerraGlaze Warranty.

Tools and Supplies Needed:

Baby shampoo (Film-On, Johnson's or equivalent)	Clean Water
Application Fluid Sprayer/Dispenser	Window scraper (for cleaning window)
Window squeegee (for cleaning window)	Microfiber cloths or terry towel(s)
Smoothee squeegee (thick rubber-e.g. Blue Max)	Sponge or Teflon scrub pad
Hard card (hard plastic, for bumping edges)	Tape

Step 1 - Window Preparation:

1. Only apply the film when the Sun is not shining on the glass and the glass is at interior room temperature of between 67º to 82ºF.
2. Prepare a mild surfactant application fluid for cleaning the window and applying SerraGlaze.
    - Fill a clean sprayer with a measured amount of clean filtered water.
    - Add ¼ ounce of Film-On/Johnson's Baby Shampoo per gallon of water. We recommend this because it does not harm the adhesive and dries clear. Other soaps and detergents are not recommended.
3. The first step in cleaning is to scrape the window with the window scraper. Remove particles with a lint-free towel such as terry cloth or microfiber towel.
4. Next, use a sponge or Teflon type scrub pad. Lightly scrub the glass with the soap solution and then use a window squeegee to clean. At the end of each squeegee pass, wipe the blade with a lint-free towel (terry cloth or microfiber towel).
5. Although the window may appear to be clean, there may still be dirt that has been pushed into the edge of the frame over the years. This dirt will flow out onto the glass when the glass is wetted and needs to be removed. This is done by taking a clean cloth—and carefully wipe all around the window frame.

Step 2 - Film Preparation:

1. Window film has a release liner on the adhesive side and must be removed to expose the adhesive. To remove the release liner, place a piece of tape on the corner of the liner. Remove the liner by pulling the tape diagonally downward, lightly misting the film with the soap solution while removing the liner. Note: if the liner is pulled off without misting the film and liner with the soap solution, it would generate a static charge and dust in the air would be drawn to the film creating bubbles in the finished installation.
2. Once the release liner is removed, mist the film evenly with the soap solution. Also mist the center of the clean glass. Do not mist the edges of the glass as residual dirt may flow back onto the glass.

3.3 INSTALLATION

Step 3 - Film Application:

1. It is strongly recommended to have two installers for all but the smallest windows with one installer holding the film and one removing the liner. Carefully place the film onto the window and position it approximately 1/16" to 1/8" from the each edge of the gasket/window frame. The soap solution will hold it in place.
2. There should be about a 1/16 inch to 1/8" gap between the film and frame. This gap is necessary to remove the solution and have the film lay flat on the window. If the film would actually touch the frame or the gasket it would not lie flat, the fluid would be difficult to remove (due to the film thickness) and there would be bubbles as the film is squeegeed.
3. Using the Smoothee Squeegee, firmly (but not very hard) at a 45 degree angle and with consistent pressure, push the squeegee outwards and then down in an "L" shape to remove the solution at the bottom of the film. Start from the center and work out and down. (This "L" motion will minimize the amount of solution that will be drawn into the edges of the film and done properly, greatly reduces the cure time before doing the perimeter treatment.) Note that with a Smoothie Squeegee, push / do not pull squeegee for improved removal of bubbles and solution. This drives more water out for a better bond. Also place a paper towel or lint free cloth at the edges to soak up the solution and reduce the capillary flow into the grooves of the film.
4. After the first pass with the Smoothee Squeegee, inspect to ensure there are no trapped bubbles and eliminate those bubbles before proceeding.
5. Due to the thickness of the film, it is best to remove the fluid by making multiple firm and even pressure passes with a paper towel or lint-free cloth at the edge to absorb the fluid. Do not press extremely hard as the film can be scratched/damaged. Misting the surface of the film may facilitate easier removal of the application fluid. Using two hands, start at the center and force the water outwards and then down to the bottom edge. It is often helpful to also put a wipe-all (absorbent towel/cloth) over the tools so that the water that is squeezed out is immediately absorbed by the towel. This is most helpful at the top edge where the water tends to drop back down behind the film. Continue this process until all visible fluid is removed and there are no bubbles.
6. As necessary at the edges of the film, bump down the edges with the hard card with a microfiber cloth at the edge to absorb any moisture pushed to the edge.

It can take up to 30 days for the film to firmly bond to the glass. While curing, the film should not be cleaned or otherwise handled. Upon installation, there will be some fluid in the grooves at the edges due to capillary action, but this will evaporate as the film cures. During the curing time, the film can also turn cloudy. That is normal and will clear up as it dries.

Step 4 – Perimeter Treatment:

1. Once the film is cured (up to 30 days), it is strongly recommended to apply a

perimeter solution to cover the un-filmed glass gap between the edge of the film and the frame or gasket. This is typically 1/16" to 1/8", but can be sources of glare if not properly covered.

2. There are several viable ways to cover the glass gap. These include:
   - Pulling the gaskets (seals) on the sides and bottom before installing the window film, waiting for the cure period, then re-installing the gaskets by spraying them with a soap solution and pressing them back in. This provides the cleanest installation, but is only available with wedge gaskets.
   - Covering the gap with a sealant.
   - Covering the gap with a self-adhesive weather strip.

3.4 CLEANING AND PROTECTION

Plastic window films might become statically charged and, as a result, attract dust. In closed rooms this phenomenon is promoted by mechanical friction at the window film surfaces, air currents and dry air.

Dust is removed with water and some dishwashing liquid, using a soft, microfiber cloth or sponge. Never wipe the surface dry. A Micro-fiber cloth or other non-fuzzing paper towel, slightly dampened with water, has a streak-free cleaning effect.

Knowing how to clean window film correctly is key to preserving its attractive appearance. Because the window film is made of plastic, it is susceptible to scratches and abrasions as well as damage by some solvents, it is important to follow these guidelines for cleaning, repairing and protecting the film

A. Remove leftover 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, the best way to clean the window film is with a mild solution of soap or detergent and water. NEVER use window cleaning fluids with ammonia (such as Windex or Formula 409), gasoline, denatured alcohol, carbon tetrachloride, or acetone -- these may cause the plastic to craze with minute cracks.

Never use sharp tools, such as a razor blades or putty knifes, to remove dirt or foreign material from a window film surface.

Never use abrasive cleansers, abrasive pads, or gritty cloths when cleaning the window film.

Begin by gently blowing away any loose dust or dirt from the acrylic's surface. Apply a

soap and water solution with a dampened non- abrasive/non-contaminating/lint-free soft cloth, microfiber cloth or cellulose sponge.

Rinse well with clear, clean water. Blot dry with a chamois, damp cellulose sponge or microfiber cloth to prevent water spotting.

END OF SECTION