SECTION 08871

SOLAR CONTROL WINDOW FILM

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PART 1 GENERAL

1.1 SECTION INCLUDES

A. Solar Control Film

1.2 RELATED SECTIONS

A. Section 08500 - Windows: Windows to receive solar control film.

B. Section 08600 – Skylights: Glass skylights to receive solar control film.

C. Section 08800 - Glazing: General Glazing applications to receive solar control film.

D. Section 08900 - Glazed Curtain Walls: Curtain Walls to receive solar control film.

1.3 REFERENCES

A. ASHRAE - American Society for Heating, Refrigeration, and Air Conditioning Engineers; Handbook of Fundamentals, 1997 Edition.

B. ASTM D 1044 - Standard Method of Test for Resistance of Transparent Plastics to Surface Abrasion (Taber Abrader Test).

C. ASTM E 84 - Standard Method of Test for Surface Burning Characteristics of Building Materials.

D. ASTM E 308 - Standard Recommended Practice for Spectophotometry and Description of Color in CIE 1931 System.

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

F. ASTM G 26 - Standard Practice for Performing Accelerated Outdoor Weatherizing for Non-metallic Materials Using Concentrated Natural Sunlight.

G. Window 5.2 - A Computer Tool for Analyzing Window Thermal Performance; Lawrence Berkeley Laboratory.

1.4 DEFINITIONS

A. Luminous Efficacy: The ratio of visible light transmission to shading coefficient.

1.5 PERFORMANCE REQUIREMENTS

A. Fire Performance: Surface burning characteristics when tested in accordance ASTM E 84:
   1. Flame Spread: 25, maximum.
   2. Smoke Developed: 450, maximum.

B. 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 Calbrase Wheel.

1.6 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.

C. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.

D. Verification Samples: For each finish product specified, two samples representing actual product, color, and patterns.

E. Performance Submittals:
   1. Provide laboratory data of emissivity and calculated window U-Factors for various outdoor temperatures based upon established calculation procedure defined by the 1997 ASHRAE Handbook of Fundamentals, Chapter 29, or Lawrence Berkeley Laboratory Window 5.2 Computer Program.

1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications: All primary products specified in this section will be supplied by a single manufacturer with a minimum of ten (10) years experience.

B. Installer Qualifications: All products listed in this section are to be installed by a single installer with a minimum of five (5) years demonstrated experience in installing products of the same type and scope as specified.
   1. Provide documentation that the installer is authorized by the Manufacturer to perform Work specified in this section.
   2. Provide a commercial building reference list of ____ (#) 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.

3. Provide a Glass Stress Analysis of the existing glass and proposed glass/film combination as recommended by the film Manufacturer.
4. Provide an application analysis to determine available energy cost reduction and savings.

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

1.8 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

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

1.9 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 absolute limits.

1.10 WARRANTY

A. At project closeout, provide to Owner or Owners Representative an executed current copy of the manufacturer’s standard limited warranty against manufacturing defect, outlining its terms, conditions, and exclusions from coverage.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer: 3M Window Films; 3M Center Bldg. 0223-02-S-24, St. Paul, MN 55144-1000. ASD. 3M Window Film Contact: Michael Hassenauer. Tel: (651) 737-1053. Fax: (651) 736-0611. Email: mjhassenauer@mmm.com. Web: http://www.3m.com/windowfilm.

B. Substitutions: Not permitted.

C. Requests for substitutions will be considered in accordance with provisions of Section 01600.

2.2 PRESTIGE SOLAR CONTROL FILM

A. Physical Properties:
1. Composition: Optically clear polyester film containing at least 220 layers and incorporating an acrylic pressure sensitive adhesive on one side and an acrylic

abrasion resistant coating on the other. Nanotechnology represents a breakthrough in technology due to the enhanced heat, UV and IR rejection, without the presence of any metals.

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

B. Performance, Prestige 70 - Clear Film, nanotechnology, no metal and at least 220 plus layers applied to 1/4 Inch (6.4 mm) Thick Clear Glass:
   1. Visible Light Transmission (ASTM E 903, ASTM E308): 68 percent when measured with an integrating sphere spectrometer and calculated using Standard Source for average daylight.
   2. Visible Reflection - Exterior (ASTM E 903): Not more than 9 percent.
   3. Visible Reflection - Interior (ASTM E 903): Not more than 9 percent.
   4. Ultraviolet Rejected (ASTM E 903): Not less than 99.9 percent.
   5. Infrared Energy Rejected (ASTM E 903): Not less than 97 percent.
   6. Luminous Efficacy: Not less than 1.17.
   7. Shading Coefficient at 90 Degrees (Normal Incidence) (ASTM E 903): Not less than 0.58.
   8. Total Solar Energy Rejected (TSER) at 90 Degrees (Normal Incidence) (ASTM E 903): Not less than 50 percent.
   9. Total Solar Energy Rejected (TSER) at 60 Degrees (ASTM E 903): Not less than 59 percent.
   10. 3M Window Film Point of Contact - Michael Hassenauer 651-737-1053. Email: mjhassenauer@mmm.com.

C. Performance, Prestige 60 - Clear Film, nanotechnology, no metal and at least 220 plus layers applied to 1/4 Inch (6.4 mm) Thick Clear Glass:
   1. Visible Light Transmission (ASTM E 84): 61 percent.
   2. Visible Reflection - Exterior (ASTM E 903): Not more than 8 percent.
   3. Visible Reflection - Interior (ASTM E 903): Not more than 8 percent.
   4. Ultraviolet Rejected (ASTM E 903): Not less than 99.9 percent.
   5. Infrared Energy Rejected (ASTM E 903): Not less than 97 percent.
   6. Luminous Efficacy: Not less than 1.11.
   7. Shading Coefficient at 90 Degrees (Normal Incidence) (ASTM E 903): Not less than 0.55.
   8. Total Solar Energy Rejected (TSER) at 90 Degrees (Normal Incidence) (ASTM E 903): Not less than 52 percent.
   9. Total Solar Energy Rejected (TSER) at 60 Degrees (ASTM E 903): Not less than 61 percent.
   10. 3M Window Film Point of Contact - Michael Hassenauer 651-737-1053. Email: mjhassenauer@mmm.com.

D. Performance, Prestige 50 - Lightly Tinted Film, nanotechnology, no metal and at least 220 plus layers applied to 1/4 Inch (6.4 mm) Thick Clear Glass:
   1. Visible Light Transmission (ASTM E 84): 50 percent.
   2. Visible Reflection - Exterior (ASTM E 903): Not more than 8 percent.
   3. Visible Reflection - Interior (ASTM E 903): Not more than 7 percent.

4. Ultraviolet Rejected (ASTM E 903): Not less than 99.9 percent.
5. Infrared Energy Rejected (ASTM E 903): Not less than 97 percent.
6. Luminous Efficacy: Not less than 0.98.
7. Shading Coefficient at 90 Degrees (Normal Incidence) (ASTM E 903): Not less than 0.51.
8. Total Solar Energy Rejected (TSER) at 90 Degrees (Normal Incidence) (ASTM E 903): Not less than 56 percent.
9. Total Solar Energy Rejected (TSER) at 60 Degrees (ASTM E 903): Not less than 63 percent.
10. 3M Window Film Point of Contact - Michael Hassenauer 651-737-1053. Email: mjhassenauer@mmm.com.

E. Performance, Prestige 40 - Lightly Tinted Film, nanotechnology, no metal and at least 220 plus layers applied to 1/4 Inch (6.4 mm) Thick Clear Glass:
1. Visible Light Transmission (ASTM E 84): 39 percent.
2. Visible Reflection - Exterior (ASTM E 903): Not more than 7 percent.
3. Visible Reflection - Interior (ASTM E 903): Not more than 6 percent.
4. Ultraviolet Rejected (ASTM E 903): Not less than 99.9 percent.
5. Infrared Energy Rejected (ASTM E 903): Not less than 97 percent.
6. Luminous Efficacy: Not less than 0.83.
7. Shading Coefficient at 90 Degrees (Normal Incidence) (ASTM E 903): Not less than 0.47.
8. Total Solar Energy Rejected (TSER) at 90 Degrees (Normal Incidence) (ASTM E 903): Not less than 59 percent.
9. Total Solar Energy Rejected (TSER) at 60 Degrees (ASTM E 903): Not less than 66 percent.
10. 3M Window Film Point of Contact - Michael Hassenauer 651-737-1053. Email: mjhassenauer@mmm.com.

2.3 3M NIGHT VISION SOLAR CONTROL FILM

A. Physical Properties:
1. Composition: Optically clear metallized polyester film which may be laminated to a clear polyester film. Acrylic pressure sensitive adhesive on one side and an acrylic abrasion resistant coating on the other. Also incorporates infrared absorbing carbon and/or metal oxide particles.
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. Thickness: Nominal 2.5 mils (0.125mm) with no evidence of coating voids.
5. Identification: Labeled as to Manufacturer as listed in this Section.

B. Performance, NV 45 - Film applied to 1/4 Inch (6.4 mm) Thick Clear Glass:
1. Emissivity: 0.78 when measured using a Devices & Services Emissometer Model AE at or near room temperature.
2. U-Factor: 1.06.
3. Visible Light Transmission (ASTM E 84): 45 percent.
4. Visible Reflection:
   a. Exterior (ASTM E 903): Not more than 8 percent.
   b. Interior (ASTM E 903): Not more than 9 percent.
5. Ultraviolet Transmission (ASTM E 903): Less than 1 percent.

6. Shading Coefficient at 90 Degrees (Normal Incidence) (ASTM E 903): Not less than 0.63.
7. 3M Window Film Point of Contact - Michael Hassenauer 651-737-1053. Email: mjhassenauer@mmm.com.

C. Performance, NV 35 - Film applied to 1/4 Inch (6.4 mm) Thick Clear Glass:
1. Emissivity: 0.74 when measured using a Devices & Services Emissometer Model AE at or near room temperature.
2. U-Factor: 1.06.
3. Visible Light Transmission (ASTM E 84): 35 percent.
4. Visible Reflection:
   a. Exterior (ASTM E 903): Not more than 12 percent.
   b. Interior (ASTM E 903): Not more than 18 percent.
5. Ultraviolet Transmission (ASTM E 903): Less than 1 percent.
6. Shading Coefficient at 90 Degrees (Normal Incidence) (ASTM E 903): Not less than 0.49.
7. 3M Window Film Point of Contact - Michael Hassenauer 651-737-1053. Email: mjhassenauer@mmm.com.

D. Performance, NV 25 - Film applied to 1/4 Inch (6.4 mm) Thick Clear Glass:
1. Emissivity: 0.72 when measured using a Devices & Services Emissometer Model AE at or near room temperature.
2. U-Factor: 1.05.
3. Visible Light Transmission (ASTM E 84): 25 percent.
4. Visible Reflection:
   a. Exterior (ASTM E 903): Not more than 13 percent.
   b. Interior (ASTM E 903): Not more than 29 percent.
5. Ultraviolet Transmission (ASTM E 903): Less than 1 percent.
6. Shading Coefficient at 90 Degrees (Normal Incidence) (ASTM E 903): Not less than 0.39.
7. 3M Window Film Point of Contact - Michael Hassenauer 651-737-1053. Email: mjhassenauer@mmm.com.

E. Performance, NV 15 - Film applied to 1/4 Inch (6.4 mm) Thick Clear Glass:
1. Emissivity: 0.70 when measured using a Devices & Services Emissometer Model AE at or near room temperature.
2. U-Factor: 1.04.
3. Visible Light Transmission (ASTM E 84): 15 percent.
4. Visible Reflection:
   a. Exterior (ASTM E 903): Not more than 19 percent.
   b. Interior (ASTM E 903): Not more than 43 percent.
5. Ultraviolet Transmission (ASTM E 903): Less than 1 percent.
6. Shading Coefficient at 90 Degrees (Normal Incidence) (ASTM E 903): Not less than 0.29.
7. 3M Window Film Point of Contact - Michael Hassenauer 651-737-1053. Email: mjhassenauer@mmm.com.

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Cut film edges neatly and square at a uniform distance of 1/8 inch (3 mm) to 1/16 inch (1.5 mm) of window sealant. Use new blade tips after 3 to 4 cuts.

C. Spray the slip solution, composed of one capful of baby shampoo or dishwashing liquid to 1 gallon of water, on window glass and adhesive to facilitate proper positioning of film.

D. Apply film to glass and lightly spray film with slip solution.

E. Squeegee from top to bottom of window. Spray slip solution to film and squeegee a second time.

F. Bump film edge with lint-free towel wrapped around edge of a 5-way tool.

G. Upon completion of film application, allow 30 days for moisture from film installation to dry thoroughly, and to allow film to dry flat with no moisture dimples when viewed under normal viewing conditions.

3.4 CLEANING AND PROTECTION

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