SECTION 08870

WINDOW FILMS

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\*\* NOTE TO SPECIFIER \*\* CoolVu, LLC; photochromic or transitional window films.  
This section is based on the products of CoolVu, LLC, which is located at:4939 Lower Roswell Rd., Bldg. BMarietta, GA 30068Tel: 844-426-6588Email: [request info (info@coolvu.com)](https://arcat.com/rfi?action=email&company=CoolVu%252C%252BLLC&message=RE%253A%2520Spec%2520Question%2520(08870coo)%253A%2520&coid=52450&spec=08870coo&rep=&fax=)  
Web: <https://www.coolvu.com>   
 [ [Click Here](https://arcat.com/company/coolvu-llc-52450) ] for additional information.  
From commercial building facades and retail storefronts to modern architectural applications, CoolVu Window Films are some of the most functional and attractive options on the market today. Unlike static window film and tinting solutions, CoolVu Window Films are recognized by their ability to adapt to the intensity of sunlight, dynamically optimizing the indoor environment for energy efficiency and thermal comfort.  
Engineered using proprietary photochromic technology, CoolVu Window Film activates from clear to tinted when exposed to sunlight. By adapting to the amount of sunlight exposure, CoolVu provides much needed sun control only when you really need it. In turn, you can enjoy 99% blockage of UV rays and up to 80% reduction in solar-induced heat increases without compromising the sun's natural light.  
The CoolVu™ brand is available throughout the US and Canada from trained and certified franchisees by CoolVu, LLC.

1. GENERAL
   1. SECTION INCLUDES
      1. Window films for retrofit onto existing building doors, windows, storefront and curtain wall.
         1. Dual layer ceramic Tinite window film. (Tinite Ceramic 35) (Tinite Ceramic 45)
         2. Dual reflective window film. (Dual Reflective 05) (Dual Reflective 15) (Dual Reflective 25) (Dual Reflective 35)
         3. Silver reflective window film. (Silver 15) (Silver 30) (Silver 50)
         4. Spectrally selective high definition window film. (High Definition 70)
         5. Transitional window film. (CV55/35) (CV35/20) (CV25/15)
         6. Safety and security window films. (CV 4Mil Clear; Interior) (CV 7Mil Clear; Exterior) (CV 8Mil Clear; Interior) (CV 16Mil Clear; Interior) (CV 21Mil Clear; Interior)
   2. RELATED SECTIONS

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

* + 1. Section 08400 - Entrances, Storefronts, and Curtain Walls.
    2. Section 08500 - Windows.
    3. Section 08600 - Roof Windows and Skylights.
    4. Section 08800 - Glazing.
  1. REFERENCES
     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 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 E903 - Standard Test Method for Solar Absorptance, Reflectance, and Transmittance of Materials Using Integrating Spheres.
  2. SUBMITTALS
     1. Submit under provisions of Section 01300.
     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.

\*\* NOTE TO SPECIFIER \*\* Delete if not applicable to product type.

* + 1. Verification Samples: 4 by 6 inches (102 by 152 mm) minimum sample of glazing film.
    2. Shop Drawings: Include details of materials, construction and finish. Include relationship with adjacent construction.
  1. QUALITY ASSURANCE
     1. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with a minimum five years documented experience.
     2. Installer Qualifications: Company specializing in performing Work of this section with minimum two years documented experience with projects of similar scope and complexity.
        1. Provide documentation that the installer is certified by glazing film manufacturer to perform the work specified.
        2. 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.

\*\* 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.

* + 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.
  4. WARRANTY
     1. Manufacturer's Warranty: Manufacturer's standard 10 year limited warranty. Will not blister, peel, change color, or bubble.
        1. Photochromic reactions are warranted for a minimum of five (5) years from date of installation. Extended warranty option available.

1. PRODUCTS
   1. MANUFACTURERS
      1. Acceptable Manufacturer: CoolVu, LLC, which is located at:4939 Lower Roswell Rd., Bldg. BMarietta, GA 30068Tel: 844-426-6588Email: [request info (info@coolvu.com)](https://arcat.com/rfi?action=email&company=CoolVu%252C%252BLLC&message=RE%253A%2520Spec%2520Question%2520(08870coo)%253A%2520&coid=52450&spec=08870coo&rep=&fax=);Web: <https://www.coolvu.com>

\*\* NOTE TO SPECIFIER \*\* Delete one of the following two paragraphs; coordinate with requirements of Division 1 section on product options and substitutions.

* + 1. Substitutions: Not permitted.
    2. Requests for substitutions will be considered in accordance with provisions of Section 01600.

CoolVu photochromic window films adapt to the intensity of sunlight on your window and door glass. CoolVu "transitions" from a lighter state to a darker, tinted state when exposed to direct sun. The patented photochromic molecular structure of CoolVu is the world's first stable climate responsive window film. Now you can enjoy clear windows when wanted and tinted windows when needed.

* 1. PERFORMANCE REQUIREMENTS
     1. Energy Performance:
        1. Block Ultraviolet Radiation: 99 percent.
        2. Block Infrared Energy: 80 percent.
        3. Transition: Up to 35 percent.
        4. Control Sun Glare: Up to 80 percent.
     2. View Enhancement:
        1. Allow for clear vision through glass at all times and lighting conditions.
        2. Glare control.

\*\* NOTE TO SPECIFIER \*\* CoolVu "TiN" dual layer ceramic window film series is constructed with two layers of titanium nitride (TiN) ceramic nanoparticles creating the richest looking and highest performing ceramic window film in the world. Manufactured in the US, the unique process and highest quality base materials behind CoolVu Tinite ensures that customers enjoy the clearest possible views through glass with the lowest interior and exterior reflection while experiencing impressive solar heat and UV block. Delete article if not required.

* 1. COOLVU DUAL LAYER CERAMIC TINITE WINDOW FILM

\*\* NOTE TO SPECIFIER \*\* Delete basis of design option not required.

* + 1. Basis of Design: Tinite Ceramic 35; as manufactured by CoolVu Window Films.
       1. Performance Requirements: Substrate of 1/8 inch (3 mm) clear glass,
          1. Solar Energy Rejected (TSER): 56 percent.
          2. Visible Light Transmitted: 37 percent.
          3. Visible Light Reflected to Interior: 10 percent.
          4. Visible Light Reflected to Exterior: 10 percent.
          5. Total Solar Energy Reflected: 13 percent.
          6. Total Solar Energy Absorbed: 60 percent.
          7. Total Solar Energy Transmitted: 27 percent.
          8. Glare Reduction: 62 percent.
          9. Shading Coefficient: 0.50.
          10. Solar Heat Gain Coefficient (SHGC): 0.44.
          11. UV Block: 99 percent.
          12. IR 0.78-2.5 Block Full Spectrum: 83 percent.
          13. IR 0.9-1.0 Block: 77 percent.
    2. Basis of Design: Tinite Ceramic 45; as manufactured by CoolVu Window Films.
       1. Performance Requirements: Substrate of 1/8 inch (3 mm) clear glass,
          1. Solar Energy Rejected (TSER): 52 percent.
          2. Visible Light Transmitted: 43 percent.
          3. Visible Light Reflected to Interior: 9 percent.
          4. Visible Light Reflected to Exterior: 9 percent.
          5. Total Solar Energy Reflected: 12 percent.
          6. Total Solar Energy Absorbed: 56 percent.
          7. Total Solar Energy Transmitted: 32 percent.
          8. Glare Reduction: 55 percent.
          9. Shading Coefficient: 0.55.
          10. Solar Heat Gain Coefficient (SHGC): 0.48.
          11. UV Block: 99 percent.
          12. IR 0.78-2.5 Block Full Spectrum: 81 percent.
          13. IR 0.9-1.0 Block: 72 percent.

\*\* NOTE TO SPECIFIER \*\* CoolVu DR series provide residential and light commercial consumers all the benefits of strong sun and glare control while maintaining clear viewing from the inside - out both day and night. Manufactured in the US, CoolVu DR architectural window films incorporate premium grade materials ensuring your home or building glass performs and looks Cool for a lifetime. Delete article if not required.

* 1. COOLVU DUAL REFLECTIVE

\*\* NOTE TO SPECIFIER \*\* Delete basis of design options not required.

* + 1. Basis of Design: Dual Reflective 05; as manufactured by CoolVu Window Films.
       1. Performance Requirements: Substrate of 1/8 inch (3 mm) clear glass,
          1. Solar Energy Rejected (TSER): 80 percent.
          2. Visible Light Transmitted: 6 percent.
          3. Visible Light Reflected to Interior: 11 percent.
          4. Visible Light Reflected to Exterior: 50 percent.
          5. Total Solar Energy Reflected: 52 percent.
          6. Total Solar Energy Absorbed: 37 percent.
          7. Total Solar Energy Transmitted: 11 percent.
          8. Glare Reduction: 92 percent.
          9. Shading Coefficient: 0.24.
          10. Solar Heat Gain Coefficient (SHGC): 0.20.
          11. UV Block: 99 percent
          12. IR 0.78-2.5 Block Full Spectrum: Not measured.
          13. IR 0.9-1.0 Block: Not measured.
    2. Basis of Design: Dual Reflective 15; as manufactured by CoolVu Window Films.
       1. Performance Requirements: Substrate of 1/8 inch (3 mm) clear glass,
          1. Solar Energy Rejected (TSER): 70 percent.
          2. Visible Light Transmitted: 17 percent.
          3. Visible Light Reflected to Interior: 13 percent.
          4. Visible Light Reflected to Exterior: 37 percent.
          5. Total Solar Energy Reflected: 37 percent.
          6. Total Solar Energy Absorbed: 45 percent.
          7. Total Solar Energy Transmitted: 18 percent.
          8. Glare Reduction: 81 percent.
          9. Shading Coefficient: 0.24
          10. Solar Heat Gain Coefficient (SHGC): 0.29
          11. UV Block: 99 percent.
          12. IR 0.78-2.5 Block Full Spectrum: Not measured.
          13. IR 0.9-1.0 Block: Not measured.
    3. Basis of Design: Dual Reflective 25; as manufactured by CoolVu Window Films.
       1. Performance Requirements: Substrate of 1/8 inch (3 mm) clear glass,
          1. Solar Energy Rejected (TSER): 63 percent.
          2. Visible Light Transmitted: 28 percent.
          3. Visible Light Reflected to Interior: 18 percent.
          4. Visible Light Reflected to Exterior: 31 percent.
          5. Total Solar Energy Reflected: 31 percent.
          6. Total Solar Energy Absorbed: 44 percent.
          7. Total Solar Energy Transmitted: 25 percent.
          8. Glare Reduction: 68 percent.
          9. Shading Coefficient: 0.35
          10. Solar Heat Gain Coefficient (SHGC): 0.36
          11. UV Block: 99 percent.
          12. IR 0.78-2.5 Block Full Spectrum: Not measured.
          13. IR 0.9-1.0 Block: Not measured.
    4. Basis of Design: Dual Reflective 35; as manufactured by CoolVu Window Films.
       1. Performance Requirements: Substrate of 1/8 inch (3 mm) clear glass,
          1. Solar Energy Rejected (TSER): 52 percent.
          2. Visible Light Transmitted: 38 percent.
          3. Visible Light Reflected to Interior: 12 percent.
          4. Visible Light Reflected to Exterior: 18 percent.
          5. Total Solar Energy Reflected: 19 percent.
          6. Total Solar Energy Absorbed: 46 percent.
          7. Total Solar Energy Transmitted: 35 percent.
          8. Glare Reduction: 57 percent.
          9. Shading Coefficient: 0.47
          10. Solar Heat Gain Coefficient (SHGC): 0.48
          11. UV Block: 99 percent.
          12. IR 0.78-2.5 Block Full Spectrum: Not measured.
          13. IR 0.9-1.0 Block: Not measured.

\*\* NOTE TO SPECIFIER \*\* Manufactured in the US, these films provide an economical solution for solar control keeping your building running cool while saving on HVAC costs. Daytime privacy is enhanced with CoolVu silver reflective window films. A manufacturer's commercial warranty of up to 15 years is available protecting you from bubbles, de-lamination and discoloration for the lifetime of your installation. Delete article if not required.

* 1. COOLVU SILVER REFLECTIVE WINDOW FILM

\*\* NOTE TO SPECIFIER \*\* Delete basis of design options not required.

* + 1. Basis of Design: Silver 15; as manufactured by CoolVu Window Films.
       1. Performance Requirements: Substrate of 1/8 inch (3 mm) clear glass,
          1. Solar Energy Rejected (TSER): 85 percent.
          2. Visible Light Transmitted: 14 percent.
          3. Visible Light Reflected to Interior: 64 percent.
          4. Visible Light Reflected to Exterior: 64 percent.
          5. Total Solar Energy Reflected: 60 percent.
          6. Total Solar Energy Absorbed: 29 percent.
          7. Total Solar Energy Transmitted: 11 percent.
          8. Glare Reduction: 84 percent.
          9. Shading Coefficient: 0.21
          10. Solar Heat Gain Coefficient (SHGC): 0.16
          11. UV Block: 99 percent
          12. IR 0.78-2.5 Block Full Spectrum: Not measured.
          13. IR 0.9-1.0 Block: Not measured.
    2. Basis of Design: Silver 30; as manufactured by CoolVu Window Films.
       1. Performance Requirements: Substrate of 1/8 inch (3 mm) clear glass,
          1. Solar Energy Rejected (TSER): 64 percent.
          2. Visible Light Transmitted: 33 percent.
          3. Visible Light Reflected to Interior: 41 percent.
          4. Visible Light Reflected to Exterior: 42 percent.
          5. Total Solar Energy Reflected: 39 percent.
          6. Total Solar Energy Absorbed: 37 percent.
          7. Total Solar Energy Transmitted: 24 percent.
          8. Glare Reduction: 63 percent.
          9. Shading Coefficient: 0.40
          10. Solar Heat Gain Coefficient (SHGC): 0.35
          11. UV Block: 99 percent
          12. IR 0.78-2.5 Block Full Spectrum: Not measured.
          13. IR 0.9-1.0 Block: Not measured.
    3. Basis of Design: Silver 50; as manufactured by CoolVu Window Films.
       1. Performance Requirements: Substrate of 1/8 inch (3 mm) clear glass,
          1. Solar Energy Rejected (TSER): 56 percent.
          2. Visible Light Transmitted: 48 percent.
          3. Visible Light Reflected to Interior: 26 percent.
          4. Visible Light Reflected to Exterior: 28 percent.
          5. Total Solar Energy Reflected: 29 percent.
          6. Total Solar Energy Absorbed: 36 percent.
          7. Total Solar Energy Transmitted: 35 percent.
          8. Glare Reduction: 47 percent.
          9. Shading Coefficient: 0.54
          10. Solar Heat Gain Coefficient (SHGC): 0.45
          11. UV Block: 99 percent
          12. IR 0.78-2.5 Block Full Spectrum: Not measured.
          13. IR 0.9-1.0 Block: Not measured.

\*\* NOTE TO SPECIFIER \*\* Manufactured in the US utilizing a proprietary blend of titanium nitride and exotic metals, CoolVu's HD window films feature superior optical clarity, block 99% of the sun's UV radiation and have a soft, natural appearance on glass. A manufacturer's commercial warranty of up to 15 years is available protecting you from bubbles, de-lamination and discoloration for the lifetime of your installation. Delete article if not required.

* 1. COOLVU SPECTRALLY SELECTIVE HD WINDOW FILM
     1. Basis of Design: High Definition 70; as manufactured by CoolVu Window Films.
        1. Performance Requirements: Substrate of 1/8 inch (3 mm) clear glass.
           1. Solar Energy Rejected (TSER): 53 percent.
           2. Visible Light Transmitted: 70 percent.
           3. Visible Light Reflected to Interior: 10 percent.
           4. Visible Light Reflected to Exterior: 9 percent.
           5. Total Solar Energy Reflected: 34 percent.
           6. Total Solar Energy Absorbed: 25 percent.
           7. Total Solar Energy Transmitted: 41 percent.
           8. Glare Reduction: 20 percent.
           9. Shading Coefficient: 0.56
           10. Solar Heat Gain Coefficient (SHGC): 0.49
           11. UV Block: 99 percent.
           12. IR 0.78-2.5 Block Full Spectrum: 80 percent.
           13. IR 0.9-1.0 Block: 95 percent.

\*\* NOTE TO SPECIFIER \*\* Adaptive to the amount of sunlight on glass, CV Transitional window films are made using a proprietary manufacturing process resulting in the world's only patented "stable photochromic" film technology. CoolVu photochromic window films adapt to the intensity of sunlight on your window and door glass. CoolVu "transitions" from a lighter state to a darker, tinted state when exposed to direct sun. The patented photochromic molecular structure of CoolVu is the world's first stable climate responsive window film. Now you can enjoy clear windows when wanted and tinted windows when needed. Delete article if not required.

* 1. COOLVU TRANSITIONAL WINDOW FILM

\*\* NOTE TO SPECIFIER \*\* Delete basis of design products not required.

* + 1. Basis of Design: CV55/35; as manufactured by CoolVu Transitional Window Films.
       1. Performance under Normal Conditions:
          1. Solar Energy Transmitted: 46.0 percent.
          2. Solar Energy Reflected: 11.0 percent.
          3. Solar Energy Absorbed: 43.0 percent.
          4. Visible Light Transmitted: 54.0 percent.
          5. Visible Light Reflected to Exterior: 11.0 percent.
          6. Visible Light Reflected to Interior: 8.0 percent.
          7. Glare Reduction: 39.0 percent.
          8. Solar Heat Gain Coefficient (SHGC): 0.43.
          9. Shading Coefficient: 0.49.
          10. Total Solar Energy Rejection: 54.0 percent.
          11. Infrared Rejection: 81.0 percent.
          12. U-Factor: 1.9.
          13. Emissivity: 0.9.
          14. Ultraviolet Rejection: More than 99 percent.
       2. Performance Fully Transitioned:
          1. Solar Energy Transmitted: 43.0 percent.
          2. Solar Energy Reflected: 11.0 percent.
          3. Solar Energy Absorbed: 46.0 percent.
          4. Visible Light Transmitted: 35.0 percent.
          5. Visible Light Reflected to Exterior: 11.0 percent.
          6. Visible Light Reflected to Interior: 8.0 percent.
          7. Glare Reduction: 60.2 percent.
          8. Solar Heat Gain Coefficient (SHGC): 0.41.
          9. Shading Coefficient: 0.56.
          10. Total Solar Energy Rejection: 58.0 percent.
          11. Infrared Rejection: 81.0 percent.
          12. U-Factor: 1.9.
          13. Emissivity: 0.85.
          14. Ultraviolet Rejection: More than 99 percent.
    2. Basis of Design: CV35/20; as manufactured by CoolVu Transitional Window Films.
       1. Performance under Normal Conditions:
          1. Solar Energy Transmitted: 44.0 percent.
          2. Solar Energy Reflected: 15.0 percent.
          3. Solar Energy Absorbed: 41.0 percent.
          4. Visible Light Transmitted: 35.0 percent.
          5. Visible Light Reflected to Exterior: 18.0 percent.
          6. Visible Light Reflected to Interior: 15.0 percent.
          7. Glare Reduction: 61.0 percent.
          8. Solar Heat Gain Coefficient (SHGC): 0.40.
          9. Shading Coefficient: 0.46.
          10. Total Solar Energy Rejection: 56.0 percent.
          11. Infrared Rejection: 83.0 percent.
          12. U-Factor: 1.0.
          13. Emissivity: 0.9.
          14. Ultraviolet Rejection: More than 99 percent.
       2. Performance Fully Transitioned:
          1. Solar Energy Transmitted: 36.0 percent.
          2. Solar Energy Reflected: 15.0 percent.
          3. Solar Energy Absorbed: 49.0 percent.
          4. Visible Light Transmitted: 25.0 percent.
          5. Visible Light Reflected to Exterior: 18.0 percent.
          6. Visible Light Reflected to Interior: 15.0 percent.
          7. Glare Reduction: 71.5 percent.
          8. Solar Heat Gain Coefficient (SHGC): 0.36.
          9. Shading Coefficient: 0.42.
          10. Total Solar Energy Rejection: 60.0 percent.
          11. Infrared Rejection: 83.0 percent.
          12. U-Factor: 1.0.
          13. Emissivity: 0.9.
          14. Ultraviolet Rejection: More than 99 percent.
    3. Basis of Design: CV25/15; as manufactured by CoolVu Transitional Window Films.
       1. Performance under Normal Conditions:
          1. Solar Energy Transmitted: 36.0 percent.
          2. Solar Energy Reflected: 20.0 percent.
          3. Solar Energy Absorbed: 44.0 percent.
          4. Visible Light Transmitted: 28.0 percent.
          5. Visible Light Reflected to Exterior: 23.0 percent.
          6. Visible Light Reflected to Interior: 21.0 percent.
          7. Glare Reduction: 69.0 percent.
          8. Solar Heat Gain Coefficient (SHGC): 0.35.
          9. Shading Coefficient: 0.40.
          10. Total Solar Energy Rejection: 64.0 percent.
          11. Infrared Rejection: 85.0 percent.
          12. U-Factor: 1.0.
          13. Emissivity: 0.9.
          14. Ultraviolet Rejection: More than 99 percent.
       2. Performance Fully Transitioned:
          1. Solar Energy Transmitted: 33.0 percent.
          2. Solar Energy Reflected: 20.0 percent.
          3. Solar Energy Absorbed: 47.0 percent.
          4. Visible Light Transmitted: 18.0 percent.
          5. Visible Light Reflected to Exterior: 23.0 percent.
          6. Visible Light Reflected to Interior: 21.0 percent.
          7. Glare Reduction: 79.5 percent.
          8. Solar Heat Gain Coefficient (SHGC): 0.33.
          9. Shading Coefficient: 0.38.
          10. Total Solar Energy Rejection: 66.0 percent.
          11. Infrared Rejection: 85.0 percent.
          12. U-Factor: 1.0.
          13. Emissivity: 0.9.
          14. Ultraviolet Rejection: More than 99 percent.

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

* 1. COOLVU CERAMIC WINDOW FILM

\*\* NOTE TO SPECIFIER \*\* CoolVu Ceramic Series window film is constructed witha single layer of ceramic nanoparticlescreating a rich looking and high performing retrofit window film solution. The soft, natural look of the Ceramic Series provides for non-mirror appearance on window and door glass both day and night, perfect for home and building glass. Manufactured in the US, the unique process and high-quality materials behind CoolVu Ceramic Series ensures that customers enjoy clear views through glass with low interior and exterior reflection while experiencing impressive solar heat and UV block. Delete basis of design products not required.

* + 1. Basis of Design: Signature Ceramic Tinted; as manufactured by CoolVu Transitional Window Films. a single layer of ceramic nanoparticles, retrofit window film solution. Non-mirror appearance on window and door glass both day and night. "True" ceramic TiN construction.
       1. Performance Under Normal Conditions:
          1. VLT: 45 percent.
          2. IR Block: 70 percent.
          3. UV Block: 99 percent.
          4. Ext. Reflection: 13 percent.
          5. Int. Reflection: 12 percent.
          6. TSER: 56 percent.
    2. Basis of Design: Signature Ceramic Clear; as manufactured by CoolVu Transitional Window Films. a single layer of ceramic nanoparticles, retrofit window film solution. Non-mirror appearance on window and door glass both day and night. "True" ceramic TiN construction.
       1. Performance Under Normal Conditions:
          1. VLT: 66 percent.
          2. IR Block: 70 percent.
          3. UV Block: 99 percent.
          4. Ext. Reflection: 8 percent.
          5. Int. Reflection: 8 percent.
          6. TSER: 38 percent.

\*\* NOTE TO SPECIFIER \*\* Delete article if not required or delete basis of design options not required.

* 1. SAFETY AND SECURITY WINDOW FILMS

\*\* NOTE TO SPECIFIER \*\* Safety and Security Window Films help reduce the risk of personal injury, property damage and loss caused by natural disaster and crime. Available in a wide range of tints, styles and grades, our films are specially designed to deter everything from the impacts to the costly eyesore of graffiti.

* + 1. Basis of Design: CV 4Mil Clear; as manufactured by CoolVu Window Films. Optically clear. Shatter resistant. Protects from broken glass hazards from glass breakage due to low force impact events. Strong glass adhesion to glass. Shock absorbent. Scratch resistant. Protect from against UV light and reduces fading of interior furnishings. Cleaned with typical window cleaning solutions.
       1. Standards Compliance and Testing:
          1. American Society for Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE):

Handbook of Fundamentals.

* + - * 1. The American Society for Testing and Materials (ASTM):

ASTM E308 Standard Recommended Practice for Spectrophotometry and Description of Color in CIE 1931 System.

ASTM E903 Standard Methods of Test for Solar Absorbance, Reflectance and Transmittance of Materials Using Integrating Spheres.

ASTM D882 Standard Test Method for Tensile Properties of Thin Plastic Sheeting.

ASTM D1044 Standard Method of Test for Resistance of Transparent Plastics to Surface Abrasion.

* + - * 1. Lawrence Berkley National Laboratory:

WINDOW 7.4. A 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.

* + - 1. Performance Requirements: 4 mil Safety. Interior glass surfaces only.
         1. Safety Glazing Impact resistance (performance to CPSC/ANSI Z97.1):

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

Impact resistance for Film Applied on 1/8-inch (3 mm) Thick Glass: 400 ft-lbs (55 kg-m) minimum to comply with ANSI Z97.1 Class A and CPSC 16 CFR 1201 Category II as safety glass.

* + - * 1. Abrasion Resistance per ASTM D1044: Film surface coating must be resistant to abrasion such that, less than 5 percent increase of transmitted light haze will result using 50 cycles, 500 grams weight, and the CS10F Calibrase Wheel.
        2. Substrate of 1/4 inch (6 mm) thick clear glass tested in accordance with ANSI/NFRC 100 - 2014 and ANSI/NFRC 200 - 2014.

Solar Heat Gain Coefficient: 0.82.

Visible Light Transmitted: 87 percent.

Visible Light Reflected Interior: 8 percent.

Visible Light Reflected Exterior: 8 percent.

U Value: 1.03.

UV Block: 99 percent.

Total Solar Energy Rejected: 19 percent.

Glare Reduction: 1.0 percent.

* + - * 1. Viewing film from a distance of 10 feet at angles up to 45 degrees from either side of the glass, the film itself. shall not appear distorted.
      1. Material: Optically clear polyester film with a durable abrasion resistant coating over one surface, and a UV stabilized pressure sensitive adhesive on the other.
         1. Film Properties:

Thickness: 0.004 inches.

Color: Clear.

Construction: Multi-ply laminate.

Tensile Strength per ASTM D882: 32,000 psi average MD/TD.

Break Strength per ASTM D882: 110 lbs per linear inch.

Puncture Strength: Greater than 65 lbs.

Elongation: Greater than 100 percent.

Peel Strength per ASTM D3330: Greater than 5 lbs per linear inch.

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

Flame Spread: 0 to 25 maximum.

Smoke Development: 0 to 450 maximum.

* + - * 1. Adhesive: Pressure sensitive weatherable acrylate adhesive applied uniformly over the surface opposite the abrasion resistant coated surface.

Optically flat.

* + 1. Basis of Design: CV 7Mil Clear; as manufactured by CoolVu Window Films. Optically clear. Shatter resistant. Protects from broken glass hazards from glass breakage due to low force impact events. Strong glass adhesion to glass. Shock absorbent. Scratch resistant. Protect from against UV light and reduces fading of interior furnishings. Cleaned with typical window cleaning solutions.
       1. Standards Compliance and Testing:
          1. American Society for Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE):

Handbook of Fundamentals.

* + - * 1. The American Society for Testing and Materials (ASTM):

ASTM E308 Standard Recommended Practice for Spectrophotometry and Description of Color in CIE 1931System.

ASTM E903 Standard Methods of Test for Solar Absorbance, Reflectance and Transmittance of Materials Using Integrating Spheres.

ASTM D882 Standard Test Method for Tensile Properties of Thin Plastic Sheeting.

ASTM D1044 Standard Method of Test for Resistance of Transparent Plastics to Surface Abrasion.

* + - * 1. Lawrence Berkley National Laboratory:

WINDOW 7.4. A 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.

* + - 1. Performance Requirements: 7 mil Safety. Exterior glass surfaces only.
         1. Safety Glazing Impact resistance (performance to CPSC/ANSI Z97.1):

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

Impact resistance for Film Applied on 1/8-inch (3 mm) Thick Glass: 400 ft-lbs (55 kg-m) minimum to comply with ANSI Z97.1 Class A and CPSC 16 CFR 1201 Category II as safety glass.

* + - * 1. Abrasion Resistance per ASTM D1044: Film surface coating must be resistant to abrasion such that, less than 5 percent increase of transmitted light haze will result using 50 cycles, 500 grams weight, and the CS10F Calibrase Wheel.
        2. Substrate of 1/4 inch (6 mm) thick clear glass tested in accordance with ANSI/NFRC 100 - 2014 and ANSI/NFRC 200 - 2014.

Solar Heat Gain Coefficient: 0.84.

Visible Light Transmitted: 88 percent.

Visible Light Reflected Interior: 8 percent.

Visible Light Reflected Exterior: 8 percent.

U Value: 1.04.

UV Block: 99 percent.

Total Solar Energy Rejected: 16 percent.

Glare Reduction: 1.0 percent.

* + - * 1. Viewing film from a distance of 10 feet at angles up to 45 degrees from either side of the glass, the film itself. shall not appear distorted.
      1. Material: Optically clear polyester film with a durable abrasion resistant coating over one surface, and a UV stabilized pressure sensitive adhesive on the other.
         1. Film Properties:

Thickness: 0.007 inches

Color: Clear.

Construction: Multi-ply laminate

Tensile Strength per ASTM D882: 25,000 psi average MD/TD.

Break Strength per ASTM D882: 170 lbs per linear inch.

Puncture Strength: Greater than 100 lbs.

Elongation: Greater than 100 percent.

Peel Strength per ASTM D3330: Greater than 5 to 6 lbs per linear inch.

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

Flame Spread: 0 to 25 maximum.

Smoke Development: 0 to 450 maximum.

* + - * 1. Adhesive: Pressure sensitive weatherable acrylate adhesive applied uniformly over the surface opposite the abrasion resistant coated surface.

Optically flat.

* + 1. Basis of Design: CV 8Mil Clear; as manufactured by CoolVu Window Films. Optically clear. Shatter resistant. Protects from broken glass hazards from glass breakage due to low force impact events. Strong glass adhesion to glass. Shock absorbant. Scratch resistant. Protect from against UV light and reduces fading of interior furnishings. Cleaned with typical window cleaning solutions.
       1. Standards Compliance and Testing:
       2. 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 Z97.1 - Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test.
       3. 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.
       4. Consumer Products Safety Council (CPSC):
          1. CPSC Part 1201 - Safety Standard for Architectural Glazing Materials.
       5. International Window Film Association (IWFA):
          1. Architectural Visual Inspection Standard for Applied Window Film as Adopted by The IWFA May 15, 1999.
          2. The American Society for Testing and Materials (ASTM):

ASTM D882 Standard Test Method for Tensile Properties of Thin Plastic Sheeting.

ASTM D1044 Standard Method of Test for Resistance of Transparent Plastics to Surface Abrasion.

ASTM D2582 - Standard Test Method for Puncture-Propagation Tear Resistance of Plastic Film and Thin Sheeting.

ASTM D3330 - Standard Test Method for Peel Adhesion at 180 Degree Angle.

ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

ASTM E903 Standard Methods of Test for Solar Absorbance, Reflectance and Transmittance of Materials Using Integrating Spheres.

* + - 1. Performance Requirements: 8 mil Safety. Interior glass surfaces only.
         1. Safety Glazing Impact resistance (performance to CPSC/ANSI Z97.1):

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

Impact resistance for Film Applied on 1/8-inch (3 mm) Thick Glass: 400 ft-lbs (55 kg-m) minimum to comply with ANSI Z97.1 Class A and CPSC 16 CFR 1201 Category II as safety glass.

* + - * 1. Flammability (performance to ASTM E84):

Flammability: Surface burning characteristics when tested in accordance ASTM E 84:

Flame Spread Index: 25, maximum.

Smoke Developed Index: 450, maximum.

* + - * 1. Abrasion Resistance per ASTM D1044: Film surface coating must be resistant to abrasion such that, less than 5 percent increase of transmitted light haze will result using 50 cycles, 500 grams weight, and the CS10F Calibrase Wheel.
        2. Performance attributes for film applied to 1/4 inch (6 mm) thick clear glass tested in accordance with ANSI/NFRC 100 - 2014 and ANSI/NFRC 200 - 2014:

Visible Light:

Transmittance: 86 percent.

Reflected: 9 percent.

Glare reduction: 3 percent.

Ultraviolet light transmittance: less than 1 percent.

U-value: 1.05.

Solar energy:

Transmittance: 73 percent.

Reflected: 8 percent.

Absorbed: 20 percent.

Shading Coefficient (SC): 0.90.

Solar Heat Gain Coefficient (SHGC): 0.79.

Emissivity: 0.90.

* + - * 1. Viewing film from a distance of 10 feet at angles up to 45 degrees from either side of the glass, the film itself. shall not appear distorted.
      1. Material: Optically clear polyester film with a durable abrasion resistant coating over one surface, and a UV stabilized pressure sensitive adhesive on the other.
         1. Film Properties:

Thickness: 0.008 inches.

Color: Clear.

Construction: Multi-ply laminate.

Tensile Strength per ASTM D882: 32,000 psi average MD/TD.

Break Strength per ASTM D882: 220 lbs per linear inch.

Puncture Strength: Greater than 125 lbs.

Elongation: Greater than 150 percent.

Peel Strength per ASTM D3330: Greater than 5 lbs per linear inch.

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

Flame Spread: 0 to 25 maximum.

Smoke Development: 0 to 450 maximum.

* + - * 1. Adhesive: Pressure sensitive weatherable acrylate adhesive applied uniformly over the surface opposite the abrasion resistant coated surface.

Optically flat.

* + 1. Basis of Design: CV 16Mil Clear; as manufactured by CoolVu Window Films. Optically clear. Shatter resistant. Protects from broken glass hazards from glass breakage due to low force impact events. Strong glass adhesion to glass. Shock absorbant. Scratch resistant. Protect from against UV light and reduces fading of interior furnishings. Cleaned with typical window cleaning solutions.
       1. Standards Compliance and Testing:
          1. American Society for Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE):

Handbook of Fundamentals.

* + - * 1. The American Society for Testing and Materials (ASTM):

ASTM E308 Standard Recommended Practice for Spectrophotometry and Description of Color in CIE 1931System.

ASTM E903 Standard Methods of Test for Solar Absorbance, Reflectance and Transmittance of Materials Using Integrating Spheres.

ASTM D882 Standard Test Method for Tensile Properties of Thin Plastic Sheeting.

ASTM D1044 Standard Method of Test for Resistance of Transparent Plastics to Surface Abrasion.

* + - * 1. Lawrence Berkley National Laboratory:

WINDOW 7.4. A 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.

* + - 1. Performance Requirements: 16 mil Safety. Interior glass surfaces only.
         1. Safety Glazing Impact resistance (performance to CPSC/ANSI Z97.1):

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

Impact resistance for Film Applied on 1/8-inch (3 mm) Thick Glass: 400 ft-lbs (55 kg-m) minimum to comply with ANSI Z97.1 Class A and CPSC 16 CFR 1201 Category II as safety glass.

* + - * 1. Abrasion Resistance per ASTM D1044: Film surface coating must be resistant to abrasion such that, less than 5 percent increase of transmitted light haze will result using 50 cycles, 500 grams weight, and the CS10F Calibrase Wheel.
        2. Substrate of 1/4 inch (6 mm) thick clear glass tested in accordance with ANSI/NFRC 100 - 2014 and ANSI/NFRC 200 - 2014.

Solar Heat Gain Coefficient: 0.82.

Visible Light Transmitted: 86 percent.

Visible Light Reflected Interior: 8 percent.

Visible Light Reflected Exterior: 8 percent.

U Value: 1.03.

UV Block: 99 percent.

Total Solar Energy Rejected: 19 percent.

Glare Reduction: 1.0 percent.

* + - * 1. Viewing film from a distance of 10 feet at angles up to 45 degrees from either side of the glass, the film itself. shall not appear distorted.
      1. Material: Optically clear polyester film with a durable abrasion resistant coating over one surface, and a UV stabilized pressure sensitive adhesive on the other.
         1. Film Properties:

Thickness: 0.016 inches.

Color: Clear.

Construction: Multi-ply laminate.

Tensile Strength per ASTM D882: 32,000 psi average MD/TD.

Break Strength per ASTM D882: 440 lbs per linear inch.

Puncture Strength: Greater than 275 lbs.

Elongation: Greater than 200 percent.

Peel Strength per ASTM D3330: Greater than 5 lbs per linear inch.

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

Flame Spread: 0 to 25 maximum.

Smoke Development: 0 to 450 maximum.

* + - * 1. Adhesive: Pressure sensitive weatherable acrylate adhesive applied uniformly over the surface opposite the abrasion resistant coated surface.

Optically flat

* + 1. Basis of Design: CV 21Mil Clear; as manufactured by CoolVu Window Films. Optically clear. Shatter resistant. Protects from broken glass hazards from glass breakage due to low force impact events. Strong glass adhesion to glass. Shock absorbant. Scratch resistant. Protect from against UV light and reduces fading of interior furnishings. Cleaned with typical window cleaning solutions.
       1. Standards Compliance and Testing:
          1. American Society for Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE):

Handbook of Fundamentals.

* + - * 1. The American Society for Testing and Materials (ASTM):

ASTM E308 Standard Recommended Practice for Spectrophotometry and Description of Color in CIE 1931System.

ASTM E903 Standard Methods of Test for Solar Absorbance, Reflectance and Transmittance of Materials Using Integrating Spheres.

ASTM D882 Standard Test Method for Tensile Properties of Thin Plastic Sheeting.

ASTM D1044 Standard Method of Test for Resistance of Transparent Plastics to Surface Abrasion.

* + - * 1. Lawrence Berkley National Laboratory:

WINDOW 7.4. A 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.

* + - 1. Performance Requirements: 21 mil Safety. Interior glass surfaces only.
         1. Safety Glazing Impact resistance (performance to CPSC/ANSI Z97.1):

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

Impact resistance for Film Applied on 1/8-inch (3 mm) Thick Glass: 400 ft-lbs (55 kg-m) minimum to comply with ANSI Z97.1 Class A and CPSC 16 CFR 1201 Category II as safety glass.

* + - * 1. Abrasion Resistance per ASTM D1044: Film surface coating must be resistant to abrasion such that, less than 5 percent increase of transmitted light haze will result using 50 cycles, 500 grams weight, and the CS10F Calibrase Wheel.
        2. Substrate of 1/4 inch (6 mm) thick clear glass tested in accordance with ANSI/NFRC 100 - 2014 and ANSI/NFRC 200 - 2014.

Solar Heat Gain Coefficient: 0.82.

Visible Light Transmitted: 86 percent.

Visible Light Reflected Interior: 8 percent.

Visible Light Reflected Exterior: 8 percent.

U Value: 1.03.

UV Block: 99 percent.

Total Solar Energy Rejected: 19 percent.

Glare Reduction: 1.0 percent.

* + - * 1. Viewing film from a distance of 10 feet at angles up to 45 degrees from either side of the glass, the film itself. shall not appear distorted.
      1. Material: Optically clear polyester film with a durable abrasion resistant coating over one surface, and a UV stabilized pressure sensitive adhesive on the other.
         1. Film Properties:

Thickness: 0.032 inches.

Color: Clear.

Construction: Multi-ply laminate.

Tensile Strength per ASTM D882: 32,000 psi average MD/TD.

Break Strength per ASTM D882: 585 lbs per linear inch.

Puncture Strength: Greater than 300 lbs.

Elongation: Greater than 200 percent.

Peel Strength per ASTM D3330: Greater than 5 lbs per linear inch.

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

Flame Spread: 0 to 25 maximum.

Smoke Development: 0 to 450 maximum.

* + - * 1. Adhesive: Pressure sensitive weatherable acrylate adhesive applied uniformly over the surface opposite the abrasion resistant coated surface.

Optically flat.

1. EXECUTION
   1. EXAMINATION
      1. Do not begin installation until substrates have been properly constructed and prepared.
         1. Examine glass surfaces to receive new film and verify that they are free from defects and imperfections, which will affect the final appearance. Correct all such deficiencies before starting the film application process.
      2. If substrate preparation is the responsibility of another installer, notify Architect in writing of unsatisfactory preparation before proceeding.
   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.
         1. The window and window framing will be cleaned thoroughly with a neutral cleaning solution. The inside surface of the window glass shall be scraped with a stainless steel razor blade with a clean, sharp edge to ensure the removal of any foreign contaminants without damage to the glass surface.
   3. INSTALLATION
      1. Surface temperature: Do not apply glazing film when surface temperature is less than 40 degrees Fahrenheit.
      2. Install in accordance with manufacturer's instructions approved submittals and in proper relationship with adjacent construction.
         1. To minimize waste, the film will need to be cut to specification utilizing a sharp razor blade neatly and square at a uniform distance of 1/16 inch (1.6 mm) of the window-sealing device.
         2. Film shall be wet applied using clean water and slip solution to facilitate positioning of the film onto the glass.
         3. To ensure efficient removal of excess water from the underside of the film and to maximize bonding of the pressure sensitive adhesive, a stiff polyurethane squeegee will be utilized.
         4. Upon completion, the film may have a dimpled appearance from residual moisture. Said moisture shall, under reasonable weather conditions, dry flat with no moisture dimples within a period of 60 days when viewed under normal viewing conditions.
   4. CLEANING AND PROTECTION
      1. Clean products in accordance with the manufacturer's recommendations.
         1. Wash film using common window cleaning solutions.
         2. Metallized constructions shall be cleaned with window cleaning solutions that are free of ammonia products.
         3. Abrasive type cleaning agents and bristle brushes, which could scratch the film, must not be used.
      2. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION