

## Site

Government Buildings

## Location

City of Denver

## Window Film

Ambiance VE 35

## Product Series

Low-E Series



## SITUATION

At an altitude of 5,280 feet above sea level, the city of Denver is subject to extreme cold in the winter and severe heat and sun in the summer. As a result, buildings have a huge need for heat in the winter and absorb excessive heat in the summer, which in turn requires cooling systems to work longer and harder. At the same time, the sun's glare and ultraviolet rays create an uncomfortable and hazardous work environment. Solar energy, a composite of electromagnetic wavelengths, contributes to fading of furnishings, excessive heat gain, sun glare, energy waste, and skin damage.

## SOLUTION

To cope, city officials authorized the fitting of solar control window films on most of the city's properties. Because of this and other ongoing energy conservation efforts, the Environmental Protection Agency honored the city and county with a Certificate of Merit for Innovative Technology. Dr. Darryl Winer, Denver's Director of Utilities, supervised the project and awarded the contract to CPFilms, whose professional dealer had recommended Vista™ by LLumar® Ambiance VE 35 low-e (low emissivity) film. Emissivity is a measure of the thermodynamic ability of a surface to absorb heat and to reflect it. The lower the emissivity, the less radiant heat is absorbed by glass and the more interior heat is retained. Additionally, the low-e film, which blocks more than 99 percent of harmful ultraviolet rays, helps protect against premature fading,\* of furnishings, fabrics and rugs. The film rejects 72 percent of the total solar energy that reaches windows — most of which is heat — thus yielding substantial savings on air conditioning in the warm months of the year.

Commenting on the selection of the film, Dr. Winer said, "We needed a film that produced good energy savings and which had good solar properties. Glazing was too expensive, and we couldn't go with an off-the-shelf product. We didn't want to use films that have highly reflective properties or distinct tinting on government buildings because we look to blend into our environment, not stand out." Vista Ambiance Film was installed as a retrofit item on the interior of glass. The film and installation is expected to pay for itself through energy savings in less than four years. By the end of 1999, more than 125,000 square feet of film had been installed in 60 city and county buildings.

## RESULT

"Annual savings were expected to be \$41,250 or about 33-cents per square foot," says Dr. Winer, "We're big on energy conservation out here. With Denver's elevation, radiation from the sun is a big issue. The film helps minimize that."



**Performance Data**

	% Total Solar Transmittance	% Total Solar Reflectance	% Total Solar Absorbance	% Visible Light Transmittance	% Visible Reflectance (exterior)	% Visible Reflectance (interior)	Winter U-value	Shading Coefficient	% Ultraviolet Ray Protection (wavelengths 280-380nm)	Emissivity	Solar Heat Gain Coefficient	% Total Solar Energy Reflected	Light-to-Solar Heat Gain Ratio (LSG)	% Summer Solar Heat Gain Reduction	% Winter Heat Loss Reduction	% Glare Reduction
Clear Glass	83	8	9	90	8	8	1.03	1.00	29	0.84	0.86	14	1.05	-	-	-
Low-E Series																
Ambiance VE35 SR CDF	20	43	37	29	36	39	0.71	0.32	>99	0.29	0.28	72	1.04	67	32	68

**EASTMAN**

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The solar performance data reported for LLumar architectural window films was captured using the National Fenestration Rating Council's (NFRC) standard guidelines for window film solar performance measurement as measured on single pane, 1/8 inch (3 mm), clear glass. Reported values are taken from representative product samples and are subject to normal manufacturing variances. Actual performance will vary based on a number of factors, including glass type and properties. \*Films do not eliminate fading—they reduce it. UV rays and heat are contributing factors to fading but other factors exist. For further information see LLumar.com/download-library. © 2008, revised 2016 Eastman Chemical Company. VISTA™, the VISTA® logo, LLumar®, the LLumar® logo and Enerlogic® are trademarks of Eastman Chemical Company or one of its wholly owned subsidiaries. As used herein, ® denotes registered trademark status in the U.S. only. (06/16) SP1084