

# COOLVU, LLC

## TEST REPORT

**SCOPE OF WORK**

CYCLIC UV WEATHERING WITH SOLAR DATA AND OPTICAL TRANSMISSION PROPERTY MEASUREMENT EVALUATION OF PHOTO REACTIVE GLASS FILMS AND COATINGS

**REPORT NUMBER**

J0509.02-106-31 R0

**TEST DATES**

01/03/19 - 04/17/19

**ISSUE DATE**

05/30/19

**RECORD RETENTION END DATE**

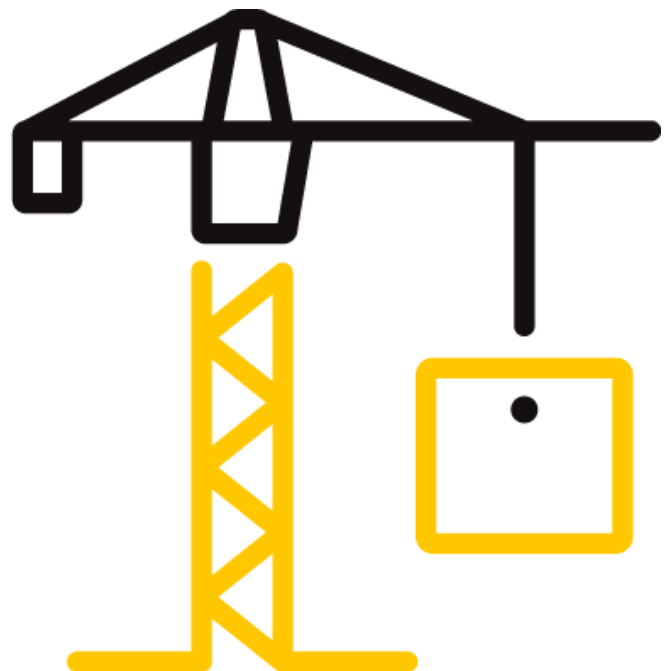
04/17/23

**PAGES**

15

**DOCUMENT CONTROL NUMBER**

ATI 00231 (09/05/17)  
RT-R-AMER-Test-2827  
© 2017 INTERTEK



## TEST REPORT FOR COOLVU, LLC

Report No.: J0509.02-106-31 R0

Date: 05/30/19

### REPORT ISSUED TO

#### COOLVU, LLC

4939 Lower Roswell Rd.

Bldg. B

Marietta, Georgia 30068

### SECTION 1

#### SCOPE

**Product:** Photo reactive glass films and coatings

Intertek Building & Construction (B&C) was contracted by CoolVu, LLC to evaluate photo reactive glass films and coatings in accordance with a client derived UV cycling procedure to measure for degradation of solar data and optical transmission properties. Results obtained are tested values and were secured by using the designated test methods. UV cycling and periodic IR, UV, Visible Light Transmission, and Solar Heat Gain Coefficient measurements were conducted at the Intertek B&C test facility in York, Pennsylvania.

The design intent of the testing was to confirm the film manufacturer's optical specifications regarding the base film and the photochromic transitions under repeated UV cycling.

This report does not constitute certification of this product nor an opinion or endorsement by this laboratory.

For INTERTEK B&C:

<b>COMPLETED BY:</b>	Joseph M. Brickner	<b>REVIEWED BY:</b>	Dawn M. Chaney
<b>TITLE:</b>	Laboratory Supervisor Materials Laboratory	<b>TITLE:</b>	Technician Team Lead Materials Laboratory
<b>SIGNATURE:</b>		<b>SIGNATURE:</b>	
<b>DATE:</b>	05/30/19	<b>DATE:</b>	05/30/19

JMB:dmc/als

This report is for the exclusive use of Intertek's Client and is provided pursuant to the agreement between Intertek and its Client. Intertek's responsibility and liability are limited to the terms and conditions of the agreement. Intertek assumes no liability to any party, other than to the Client in accordance with the agreement, for any loss, expense or damage occasioned by the use of this report. Only the Client is authorized to permit copying or distribution of this report and then only in its entirety. Any use of the Intertek name or one of its marks for the sale or advertisement of the tested material, product or service must first be approved in writing by Intertek. The observations and test results in this report are relevant only to the sample(s) tested. This report by itself does not imply that the material, product, or service is or has ever been under an Intertek certification program.

## TEST REPORT FOR COOLVU, LLC

Report No.: J0509.02-106-31 R0

Date: 05/30/19

### SECTION 2

#### TEST METHOD

The specimens were evaluated in accordance with a client derived method for UV cycling and percentage of photo reactive change to establish cycle timing. The method of UV cycling was aimed to replicate the test conditions performed by the film manufacturer and provided to CoolVu, LLC.

### SECTION 3

#### MATERIAL SOURCE

The materials were provided by CoolVu, LLC and were sourced from the film manufacturer. The following were received on October 31, 2018: Four (4), glass specimens with various photo reactive glass films and coatings.

Materials as tested are commercially known as CV75/50, and are specified as a 2 mil thick, nano-ceramic particle coated precious metal magnetron sputtered surface applied glass film. Manufacturers' performance specifications are included in the addendum.

Refer to the product description photo in Section 9. The material was tested as received after establishing baseline optical properties. Representative test specimens will be retained by Intertek B&C for a minimum of four years from the test completion date.

### SECTION 4

#### LIST OF OFFICIAL OBSERVERS

NAME	COMPANY
Joseph M. Brickner	Intertek B&C
Dawn M. Chaney	Intertek B&C

## TEST REPORT FOR COOLVU, LLC

Report No.: J0509.02-106-31 R0

Date: 05/30/19

### SECTION 5

#### TEST PROCEDURE

All conditioning of test specimens and test conditions were at standard laboratory conditions unless otherwise reported. Refer to the test related photos in Section 9.

#### UV Cycling with Solar Data and Optical Transmission Property

Specimens were measured for initial and periodic (every 1,000 cycles) IR, UV, Visible Light Transmission, and Solar Heat Gain Coefficient measurements using an EDTM Model WP4500 Window Energy Profiler device.

UV cycling was performed by locating the specimens exterior face 6.5" from a blacklight UV source (385-400nm wavelength). The exposure cycle consisted of a 2 minute activation period during which the blacklight UV source was activated followed by an 18 minute period of darkness. This process allowed the photo reactive glass films and coatings to transition (darken) to a visible light transmission level of approximately 0.45 (45%) followed by a recovery period allowing a return to a visible light transmission level of approximately 0.72 (72%).

Periodic measurements were recorded every 1,000 cycles of photo reactive transition to determine if the films or coatings ability to block light transmission were reduced.

### SECTION 6

#### TEST SPECIMEN DESCRIPTION

TEST PROCEDURE	NUMBER OF SPECIMENS	NOMINAL SPECIMEN DIMENSIONS	VISUAL CHARACTERISTICS
UV Cycling with Solar Data and Optical Transmission Property	4	3 - 4" x 4" 1 - 7" x 7"	Glass with film or coating

**TEST REPORT FOR COOLVU, LLC**

Report No.: J0509.02-106-31 R0

Date: 05/30/19

**SECTION 7**

**TEST RESULTS**

**UV Cycling with Solar Data and Optical Transmission Property**

**Post 1,000 UV Cycles**

SPECIMEN	INITIAL	POST 1,000 UV CYCLES		UNITS OF CHANGE
	At Rest	Activated (2 min)	At Rest (18 min)	At Rest (18 Min)
<b>#1 - Clear Film</b>				
UV (365 nm)	0.00	0.00	0.00	0.00
VLT (400-700 nm)	0.71	0.48	0.71	0.00
IR (950 nm)	0.18	0.17	0.17	-0.01
SHGC	0.41	0.27	0.42	0.01
<b>#2 - Low-E Film</b>				
UV (365 nm)	0.00	0.00	0.00	0.00
VLT (400-700 nm)	0.68	0.44	0.64	-0.04
IR (950 nm)	0.15	0.15	0.15	0.00
SHGC	0.33	0.27	0.31	-0.02
<b>#3 - Clear Film (New)</b>				
UV (365 nm)	0.00	0.00	0.00	0.00
VLT (400-700 nm)	0.72	0.51	0.70	-0.02
IR (950 nm)	0.17	0.16	0.16	-0.01
SHGC	0.42	0.27	0.41	-0.01
<b>#4 - Clear Film (New)</b>				
UV (365 nm)	0.00	0.00	0.00	0.00
VLT (400-700 nm)	0.72	0.48	0.70	-0.02
IR (950 nm)	0.17	0.17	0.17	0.00
SHGC	0.41	0.27	0.42	0.01

**TEST REPORT FOR COOLVU, LLC**

Report No.: J0509.02-106-31 R0

Date: 05/30/19

**Post 2,000 UV Cycles**

SPECIMEN	INITIAL	POST 2,000 UV CYCLES		UNITS OF CHANGE
	At Rest	Activated (2 min)	At Rest (18 min)	At Rest (18 Min)
<b>#1 - Clear Film</b>				
UV (365 nm)	0.00	0.00	0.00	0.00
VLT (400-700 nm)	0.71	0.46	0.70	-0.01
IR (950 nm)	0.18	0.17	0.17	-0.01
SHGC	0.41	0.27	0.42	0.01
<b>#2 - Low-E Film</b>				
UV (365 nm)	0.00	0.00	0.00	0.00
VLT (400-700 nm)	0.68	0.43	0.62	-0.06
IR (950 nm)	0.15	0.15	0.15	0.00
SHGC	0.33	0.27	0.30	-0.03
<b>#3 - Clear Film (New)</b>				
UV (365 nm)	0.00	0.00	0.00	0.00
VLT (400-700 nm)	0.72	0.47	0.69	-0.03
IR (950 nm)	0.17	0.16	0.16	-0.01
SHGC	0.42	0.27	0.40	-0.02
<b>#4 - Clear Film (New)</b>				
UV (365 nm)	0.00	0.00	0.00	0.00
VLT (400-700 nm)	0.72	0.48	0.70	-0.02
IR (950 nm)	0.17	0.17	0.18	0.01
SHGC	0.41	0.27	0.42	0.01

**TEST REPORT FOR COOLVU, LLC**

Report No.: J0509.02-106-31 R0

Date: 05/30/19

**Post 3,000 UV Cycles**

SPECIMEN	INITIAL	POST 3,000 UV CYCLES		UNITS OF CHANGE
	At Rest	Activated (2 min)	At Rest (18 min)	At Rest (18 Min)
<b>#1 - Clear Film</b>				
UV (365 nm)	0.00	0.00	0.00	0.00
VLT (400-700 nm)	0.71	0.47	0.71	0.00
IR (950 nm)	0.18	0.17	0.17	-0.01
SHGC	0.41	0.27	0.42	0.01
<b>#2 - Low-E Film</b>				
UV (365 nm)	0.00	0.00	0.00	0.00
VLT (400-700 nm)	0.68	0.43	0.64	-0.04
IR (950 nm)	0.15	0.15	0.15	0.00
SHGC	0.33	0.27	0.30	-0.03
<b>#3 - Clear Film (New)</b>				
UV (365 nm)	0.00	0.00	0.00	0.00
VLT (400-700 nm)	0.72	0.48	0.70	-0.02
IR (950 nm)	0.17	0.16	0.16	-0.01
SHGC	0.42	0.27	0.41	-0.01
<b>#4 - Clear Film (New)</b>				
UV (365 nm)	0.00	0.00	0.00	0.00
VLT (400-700 nm)	0.72	0.50	0.70	-0.02
IR (950 nm)	0.17	0.17	0.17	0.00
SHGC	0.41	0.27	0.42	0.01

**TEST REPORT FOR COOLVU, LLC**

Report No.: J0509.02-106-31 R0

Date: 05/30/19

**Post 4,000 UV Cycles**

SPECIMEN	INITIAL	POST 4,000 UV CYCLES		UNITS OF CHANGE
	At Rest	Activated (2 min)	At Rest (18 min)	At Rest (18 Min)
<b>#1 - Clear Film</b>				
UV (365 nm)	0.00	0.00	0.00	0.00
VLT (400-700 nm)	0.71	0.46	0.71	0.00
IR (950 nm)	0.18	0.17	0.16	-0.02
SHGC	0.41	0.27	0.42	0.01
<b>#2 - Low-E Film</b>				
UV (365 nm)	0.00	0.00	0.00	0.00
VLT (400-700 nm)	0.68	0.43	0.62	-0.06
IR (950 nm)	0.15	0.15	0.15	0.00
SHGC	0.33	0.27	0.30	-0.03
<b>#3 - Clear Film (New)</b>				
UV (365 nm)	0.00	0.00	0.00	0.00
VLT (400-700 nm)	0.72	0.49	0.69	-0.03
IR (950 nm)	0.17	0.16	0.16	-0.01
SHGC	0.42	0.27	0.41	-0.01
<b>#4 - Clear Film (New)</b>				
UV (365 nm)	0.00	0.00	0.00	0.00
VLT (400-700 nm)	0.72	0.49	0.70	-0.02
IR (950 nm)	0.17	0.17	0.17	0.00
SHGC	0.41	0.27	0.42	0.01



**TEST REPORT FOR COOLVU, LLC**

Report No.: J0509.02-106-31 R0

Date: 05/30/19

**Post 5,000 UV Cycles**

SPECIMEN	INITIAL	POST 5,000 UV CYCLES		UNITS OF CHANGE
	At Rest	Activated (2 min)	At Rest (18 min)	At Rest (18 Min)
<b>#1 - Clear Film</b>				
UV (365 nm)	0.00	0.00	0.00	0.00
VLT (400-700 nm)	0.71	0.48	0.70	-0.01
IR (950 nm)	0.18	0.17	0.16	-0.02
SHGC	0.41	0.27	0.41	0.00
<b>#2 - Low-E Film</b>				
UV (365 nm)	0.00	0.00	0.00	0.00
VLT (400-700 nm)	0.68	0.45	0.63	-0.05
IR (950 nm)	0.15	0.14	0.15	0.00
SHGC	0.33	0.27	0.30	-0.03
<b>#3 - Clear Film (New)</b>				
UV (365 nm)	0.00	0.00	0.00	0.00
VLT (400-700 nm)	0.72	0.49	0.70	-0.02
IR (950 nm)	0.17	0.16	0.16	-0.01
SHGC	0.42	0.27	0.40	-0.02
<b>#4 - Clear Film (New)</b>				
UV (365 nm)	0.00	0.00	0.00	0.00
VLT (400-700 nm)	0.72	0.51	0.70	-0.02
IR (950 nm)	0.17	0.17	0.17	0.00
SHGC	0.41	0.27	0.42	0.01

**SECTION 8  
CONCLUSION**

Throughout the 5,000 transition cycle testing there was no noticeable degradation in the ability of the film to transition from its average resting state (71% VLT) to its transitioned state (average 48%). Optical data taken by the lab (UV, IR, VLT, SHGC) also held stable through the 5,000 cycle testing. (See addendum)

## TEST REPORT FOR COOLVU, LLC

Report No.: J0509.02-106-31 R0

Date: 05/30/19

### SECTION 9 PHOTOGRAPHS



**Photo No. 1**  
**Specimens - As-Received**

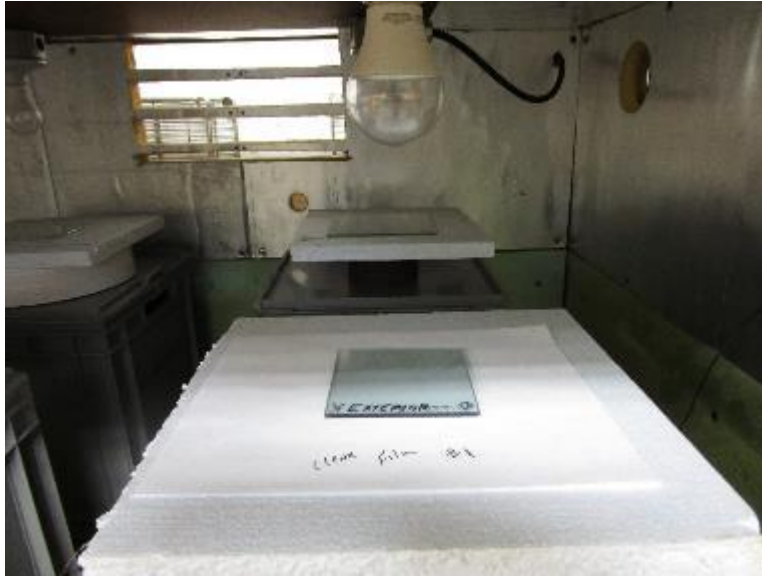


**Photo No. 2**  
**EDTM Window Energy Profiler**

## TEST REPORT FOR COOLVU, LLC

Report No.: J0509.02-106-31 R0

Date: 05/30/19



**Photo No. 3**  
**Specimens - At Rest**

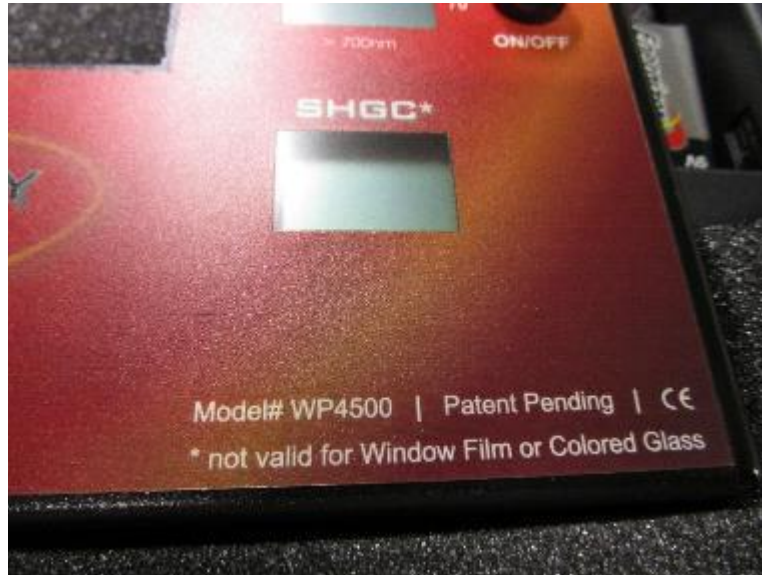


**Photo No. 4**  
**Specimens - At Activation**

## TEST REPORT FOR COOLVU, LLC

Report No.: J0509.02-106-31 R0

Date: 05/30/19



**Photo No. 5**  
**EDTM Window Energy Profiler - Identification**



**Photo No. 6**  
**UV Blacklight - Identification**



Total Quality. Assured.

**TEST REPORT FOR COOLVU, LLC**

Report No.: J0509.02-106-31 R0

Date: 05/30/19

**SECTION 10**  
**SPECIFICATIONS**

130 Derry Court  
York, Pennsylvania 17406

Telephone: 717-764-7700

Facsimile: 717-764-4129

[www.intertek.com/building](http://www.intertek.com/building)

# CoolVu Triggered Specifications

## CV75/50

Total Solar Energy		Darkest
Transmitted %	52.0	45.0
Reflected %	11.0	11.0
<b>Absorbed %</b>	<b>37.0</b>	<b>44.0</b>
Visible Light		
Transmitted %	73.0	40.0
Reflected Exterior %	9.0	9.0
Reflected Interior %	8.0	8.0
Glare Reduction %	10.0	45.0
Solar Heat Gain Coefficient	0.50	0.45
Shading Coefficient	0.58	0.51
Total Solar Energy Rejection%	48.0	52.0
Infrared Rejection %	81.0	81.0
U-Factor	1.5	1.5
Emissivity	0.9	0.85
Ultraviolet Rejection %	+99.0	+99.0

## CV55/35

Total Solar Energy		Darkest
Transmitted %	46.0	43.0
Reflected %	11.0	11.0
<b>Absorbed %</b>	<b>43.0</b>	<b>46.0</b>
Visible Light		
Transmitted %	48.0	35.0
Reflected Exterior %	11.0	11.0
Reflected Interior %	8.0	8.0
Glare Reduction %	39.0	60.2
Solar Heat Gain Coefficient	0.43	0.41
Shading Coefficient	0.49	0.46
Total Solar Energy Rejection%	54.0	58.0
Infrared Rejection %	81.0	81.0
U-Factor	1.9	1.9
Emissivity	0.9	0.85
Ultraviolet Rejection %	+99.0	+99.0

## CV35/20

Total Solar Energy		Darkest
Transmitted %	44.0	36.0
Reflected %	15.0	15.0
<b>Absorbed %</b>	<b>41.0</b>	<b>44.0</b>
Visible Light		
Transmitted %	35.0	25.0
Reflected Exterior %	18.0	18.0
Reflected Interior %	15.0	15.0
Glare Reduction %	61.0	71.5
Solar Heat Gain Coefficient	0.40	0.36
Shading Coefficient	0.46	0.42
Total Solar Energy Rejection %	56.0	60.0
Infrared Rejection %	83.0	83.0
U-Factor	1.0	1.0
Emissivity	0.9	0.9
Ultraviolet Rejection %	+99.0	+99.0

## CV25/15

Total Solar Energy		Darkest
Transmitted %	36.0	33.0
Reflected %	20.0	20.0
<b>Absorbed %</b>	<b>44.0</b>	<b>47.0</b>
Visible Light		
Transmitted %	28.0	18.0
Reflected Exterior %	23.0	23.0
Reflected Interior %	21.0	21.0
Glare Reduction %	69.0	79.5
Solar Heat Gain Coefficient	0.35	0.33
Shading Coefficient	0.40	0.38
Total Solar Energy Rejection%	64.0	66.0
Infrared Rejection %	85.0	85.0
U-Factor	1.0	1.0
Emissivity	0.9	0.9
Ultraviolet Rejection %	+99.0	+99.0





Total Quality. Assured.

130 Derry Court  
York, Pennsylvania 17406

Telephone: 717-764-7700  
Facsimile: 717-764-4129  
[www.intertek.com/building](http://www.intertek.com/building)

**TEST REPORT FOR COOLVU, LLC**

Report No.: J0509.02-106-31 R0

Date: 05/30/19

**SECTION 11**

**REVISION LOG**

REVISION #	DATE	PAGES	REVISION
0	05/30/19	N/A	Original Report Issue