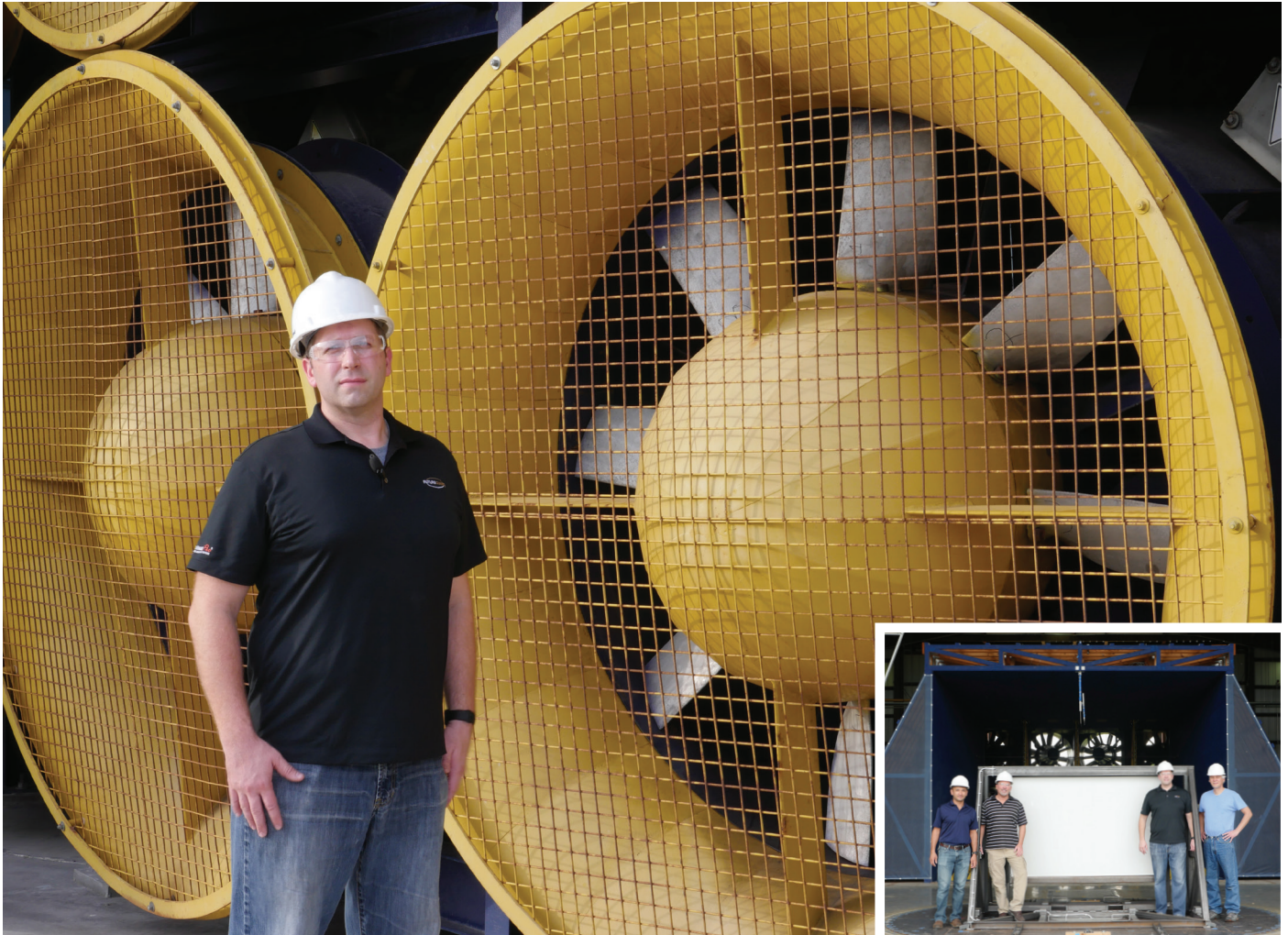


EXTERIOR SHADES



Solar Control Solutions Product Manager Clint Childress in front of Florida International University's (FIU) Wall of Wind (WOW)
 Insert: One of eleven FlexShade® ZIP units set up in front of the Wall of Wind and FIU staff.

- Draper's FlexShade® ZIP is often used to protect outdoor spaces from sun, heat, wind, and insects. Because the FlexShade® ZIP is used in some especially windy areas of the world, Draper wanted to see how much wind the product could withstand.

WIND TUNNEL TEST

When a shade system is being used outdoors, it's important that it be as resistant as possible to wind and weather. Draper's FlexShade ZIP is often used to protect outdoor spaces from sun, heat, wind, and insects. Its wind resistance comes from extruded aluminum side channels that incorporate plastic inner channels. Cushioning pads dampen fabric movement, and "zip" details attached to the fabric's edges keep it in place.

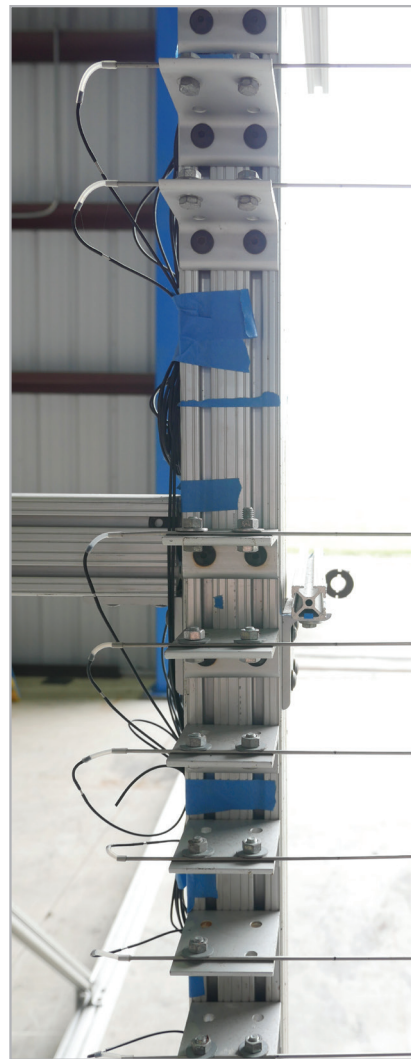
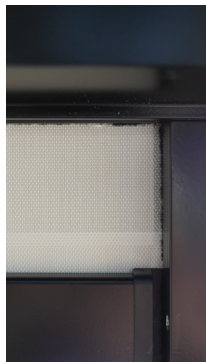
Because the FlexShade ZIP is used in some especially windy areas of the world, Draper wanted to see how much wind the product could withstand.

"We wanted to understand the limits of our product better," said Clint Childress, LEED®AP, solar control solutions product manager for Draper. "With exterior shading, end users and designers want to know the performance in the elements. The testing helps show and give guidelines."

THE FACILITY

For the testing, Draper used Florida International University's (FIU) Wall of Wind (WOW). Other wind testing facilities couldn't generate the wind speeds we wanted to observe, plus they recycled their air and were concerned about flying product pieces damaging their equipment. However, the FIU WOW is an open jet wind tunnel, capable of generating wind speeds of 150 mph (241 kph) at 10.5 feet (3.2 m) above the ground.

WHITE PAPER : FLEXSHADE® ZIP VERSUS WOW



Left: FlexShade® ZIP detail Above: WOW measuring probes.

The test shades were mounted to a metal support structure custom-built of 3" x 3" (7.62 x 7.62 cm) square steel tubing. Two different sizes of frames were provided to accommodate three different shade sizes.

The three sizes tested were (width x height) 79-³/₈" x 56-¹³/₁₆" (201.6 x 144.3 cm), 100" x 71-¹/₂" (254 x 181.6 cm), and 126" x 90" (320 x 228.6 cm). For each size, fabrics with three different openness factors were used: Soltis B92, which is an opaque blackout fabric, and 3% and 10% Mermet E screen.

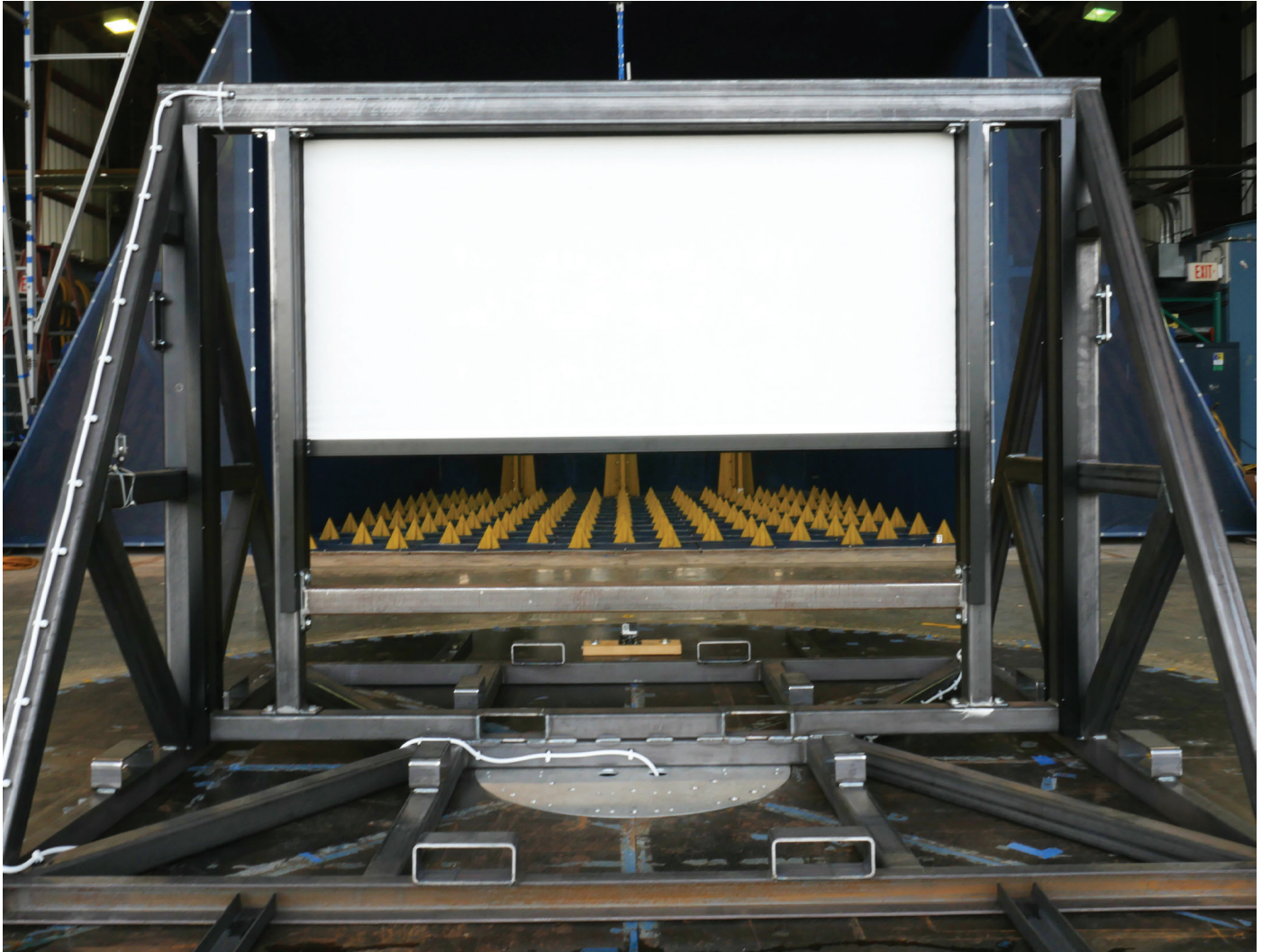
TEST PROCEDURE

According to the test report from FIU, "The WOW was configured to produce a wind profile representative of Open Terrain Exposure (ASCE 7 Exposure Category C)."

That essentially means wind that would be experienced in flat, open ground with few obstructions.

Ten tests were conducted with the wind flowing perpendicular to the front of the shade and one with the flow perpendicular to the back side of the shade. The exterior shades were all in the fully down position (rolled-down to cover the entire opening that they are meant to enclose).

Testing started at low speeds and wind was increased at 5 mph increments. Each wind speed was held constant for one minute before being increased to the next level. This process was repeated for each shade until the unit or one of its components flew off, or until maximum wind speed was reached.



WIND SPEED MEASUREMENT DEVICES*

Manufacturer	TurbulentFlow
Model	Cobra Probes
Serial Numbers of probes	229
Accuracy	+/- 0.5 m/s and +/-1% pitch and yaw at up to 30% turbulence
Frequency response	0-2000 Hz
Data Acquisition Sampling Rate	156 Hz
Location	At the exit of the flow management section at a height 10.5 ft (3.2 m) above the floor (CPI).

*Information provided by FIU

THE RESULTS

Eleven units were tested, including two FlexShade ZIP XL shades. Twice the FlexShade ZIP survived until 145 mph (233.3 kph) and once made it to the maxed-out wind speed of 150 mph (241.4 kph). The screen survived intact with some

fabric stretching and was able to be operated to the open position after the test. Only one unit of the eleven tested did not survive well beyond 100 mph (160.9 kph), failing at 95 mph. (152.8 kph) For complete results of all tests, please consult the chart on page four.

Based on our examination of the data from the tests, we are confident in the FlexShade ZIP's ability to withstand wind speeds of up to 100 mph (160.9 kph) when in the down position.

"We wanted to see the zip shade fabric stay in channels in wind speeds equal to thunder storms, but approaching hurricane wind speeds was beyond our hopes," Childress said. "Wind speeds of 55 mph (88.5 kph) or more are rare events. In these speeds, flying debris will be bigger concern than the wind itself to the shade. If you are end user, you can leave the shades down and not worry about damage caused strictly by the wind, unless it is a significant and very rare storm event."

WHITE PAPER : FLEXSHADE® ZIP VERSUS WOW

TEST RESULTS

Test Number	Fabric	Dimensions (w x h)	Openness Factor	Type	Wind Direction	Failure Point
1	Mermet E-Screen	79- ³ / ₈ " X 56- ¹³ / ₁₆ " (201.6 X 144.3 cm)	10	FlexShade ZIP	180 degrees perpendicular from outside	150 mph (241 kph)
2	Mermet E-Screen	79- ³ / ₈ " X 56- ¹³ / ₁₆ " (201.6 X 144.3 cm)	3	FlexShade ZIP	180 degrees perpendicular from outside	140 mph (225 kph)
3	Soltis Opaque B92N	79- ³ / ₈ " X 56- ¹³ / ₁₆ " (201.6 X 144.3 cm)	0	FlexShade ZIP	180 degrees perpendicular from outside	130 mph (209 kph)
4	Mermet E-Screen	100" X 71- ¹ / ₂ " (254 X 181.6 cm)	10	FlexShade ZIP	180 degrees perpendicular from outside	130 mph (209 kph)
5	Mermet E-Screen	100" X 71- ¹ / ₂ " (254 X 181.6 cm)	3	FlexShade ZIP	180 degrees perpendicular from outside	145 mph (233 kph)
6	Soltis Opaque B92N	100" X 71- ¹ / ₂ " (254 X 181.6 cm)	0	FlexShade ZIP	180 degrees perpendicular from outside	145 mph (233 kph)
7	Mermet E-Screen	126" X 90" (320 X 228.6 cm)	10	FlexShade ZIP	180 degrees perpendicular from outside	95 mph (152 kph)
8	Mermet E-Screen	126" X 90" (320 X 228.6 cm)	3	FlexShade ZIP	180 degrees perpendicular from outside	120 mph (193 kph)
9	Soltis Opaque B92N	126" X 90" (320 X 228.6 cm)	0	FlexShade ZIP	180 degrees perpendicular from outside	120 mph (193 kph)
10	Mermet E-Screen	126" X 90" (320 X 228.6 cm)	3	FlexShade ZIP XL	180 degrees perpendicular from outside	125 mph (201 kph)
11	Mermet E-Screen	126" X 90" (320 X 228.6 cm)	3	FlexShade ZIP XL	180 degrees perpendicular from inside	115 mph (185 kph)

THE CAVEATS

Despite these tests, where the shades were tested in a worst-case scenario (fully extended), no shade product should ever be left in the down position during high winds. While FlexShade ZIP withstood high wind speeds, these tests did not take into account flying debris.

In addition, the quality of installation, the sturdiness of the mounting surface, other environmental factors, and the age of the installation all play a role in determining how much wind an individual product can withstand.

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