GreenSource
THE MAGAZINE OF SUSTAINABLE DESIGN

Comfort on Demand

Photo courtesy of Phantom Screens

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GreenSource

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Comfort on Demand

Retractable screens cut heat and glare, offer insect control, natural ventilation, and energy savings...and then disappear to restore unobstructed views.

Retractable screens help achieve thermal comfort and energy savings.
(Photo courtesy of the Westin Resort & Spa, Whistler, BC.)

Provided by Phantom Screens

With the move to more sustainable buildings, architects are continually looking for cost-effective ways to achieve thermal comfort and energy savings in fenestration design. One option that's been used in Europe for decades and is now gaining acceptance in North America sits at the upper end of today's screen sophistication spectrum: retractable screens that are engineered to block from 40 to 100 percent of the sun's heat and damaging ultra violet (UV) rays — and then disappear when they're not needed.

Used properly, retractable screens offer a solution to a myriad of issues in designing buildings with reduced carbon footprints and a greater connection with nature: they form part of a building's daylighting strategy to lower energy costs and increase occupant comfort while promoting natural ventilation, insect protection and enhanced privacy. Because of their functionality in all these areas, retractable screens are applicable to buildings that incorporate the principles of sustainability and human health and well being.

Retractable screens are made from dimensionally stable synthetic mesh fabrics in a range of sizes geared to small and large windows as well as oversized openings. They are also available in various colors and levels of opaqueness, or openness, corresponding to the amount of light, control, and visibility required. Their versatility makes retractable screen systems sustainable solutions in commercial, health care, hospitality, educational and institutional environments.

CONTINUING EDUCATION

Use the learning objectives below to focus your study as you read **Comfort on Demand**. To earn one AIA/CES Learning Unit, including one hour of health safety welfare/sustainable design (HSW/SD) credit, answer the questions on page 11, then follow the reporting instructions or go to **ce.greensourcemag.com** and follow the reporting instructions.

LEARNING OBJECTIVES

After reading this article, you should be able to:

- Explain the daylighting potential of retractable screens
- Compare the solar shading benefits of exterior- to interior-mounted screens
- Identify the design decisions that maximize the sustainability potential of retractable screens
- Discuss approaches to integrating retractable screens into sustainable building design

This article will discuss retractable screens in terms of design considerations, energy savings potential and salutary effects on human health and welfare as well as their contribution to a daylighting strategy and the sustainability of their component parts.

THE BASICS OF RETRACTABLE SCREENS

Screens can be retracted manually or they can be motorized. Smaller manually operated screens can be good solutions in commercial projects where there is a need for insect protection. In the case of ventilating windows and egress doors, manually operated retractable screens can generally be used.

Retractable window screens should have a mesh retention system built into the vertical track so that mild winds will not blow the mesh out of the track. On a door, mesh retention systems are not as important as the horizontal track length is generally not as long; however, in areas of high wind this should be discussed with the manufacturer as door systems with options for mesh retention are available.

There are various retraction methods available now for manually operated insect screens:

1. constant tension coil springs which are typically constructed of steel and then coated with a waterproof lubricant to prevent rusting. The springs are enclosed for further protection from corroding particles. Stainless steel is also used but may not be as strong and durable.
2. counterbalance weight systems where the weight is used to self-retract; and
3. non-self retracting systems that need manual assistance; it will not retract on its own.

Motorized retractable screens, which should be certified to conform to UL Standard 325 for the US and certified to CSA Standard C22.2 No. 247 for Canada, offer sleek-cost-effective solutions to shading the glass facades of today's buildings. The mesh is held tightly into the track on both sides with a zipper system to prevent blowout. There should be a seal at the bottom of the slide bar when it's also being used for insect protection. There is often a brush system at the top for cleaning the mesh as it retracts onto the roller, and also to prevent bugs from entering at the top.

These screens operate vertically and instead of using tension springs, an electric motor is used usually drawing 120 Volts and up to 2.1 amps at full load. The radio frequency motors draw a nominal amount of energy when in stand-by.

The motor powers the screen up. For lowering, the motor releases the mesh at a controlled rate and a weighted slide bar attached to the end of the mesh gives the gravitational force necessary to pull the mesh down. It is not being forcibly driven down like a garage door.

Operating Systems for Solar Tracking

Motorized retractable screens are typically operated through radio frequency remote. Controls can be as simple as a hand-held remote control or incorporated into a building automation system.

Manually retractable screens can be used in ventilating windows and egress doors. (Photo courtesy of Phantom Screens.)

If an automation system is selected, multiple screens can be made to operate independently of each other, or simultaneously in virtually any combination of groupings. Environmental sensors are available that automate the function of the screens with typical triggers being solar intensity and/or wind. This allows optimum performance based on environmental conditions vis a vis the building location and orientation.

A sun sensor is available that is equipped with a solar panel that recharges the batteries contained in the unit. It is about the size of a hockey puck and can be easily placed and moved around the building. Individual controls are available so that the building automation system settings can be over-ridden.

CONTROLLING LIGHT AND SOLAR HEAT GAIN

Fenestration is an important and highly desired part of any building — but its role in a structure's heat gain needs to be clearly understood. Proper sizing, orientation and location of windows must all be carefully considered in controlling heat gain, but even so, other types of shading protection are often necessary. Interior shading devices like blinds or vertical louvers can provide glare control and they do provide immediate personal controls to regulate heat and light; however, interior blinds can interfere with furniture layouts and operations, attract dust and, unless mechanized, their performance will not maximize cooling load reduction. Preventing solar

heat gain from coming through the window in the first place by using an exterior mounted screen offers an alternative solution on many levels.

Exterior shade systems — including overhangs, louvers, light shelves, awnings, fins and screens — are considered to be more effective than interior systems in blocking solar heat gain. Because retractable screens and other external devices can be mounted on the window exterior, they absorb and dissipate the sun's heat and glare before it even reaches the glazing.

A study commissioned by the Professional Awning Manufacturers Association and conducted by the Center for Sustainable Building Research at University of Minnesota showed that stopping solar rays before they reach the room, at the exterior of the building, reduces the heat buildup between 65 percent and 77 percent. The U.S. Department of Housing and Urban Development calls any way that stops the sun before it gets through the glass "seven times as good at keeping the interior cool as blinds or curtains on the inside." While interior shades cut the intensity and heat of direct sunlight, even a light-colored interior shade reduces solar heat gain by about one-third to one-half of the incident solar energy, while an exterior shade can reduce 80 percent of the incident solar energy. ("Daylighting Design in Libraries," Edward T. Dean, AIA, 2005)

Retractable Screens

Fixed shading systems like overhangs perform well on south-facing windows, though they will not effectively block direct east or west sunlight that can cause large amounts of heat gain and glare particularly at the beginning and end of the work day. Dynamic systems such as retractable screens perform well on south-facing as well as on east- and west-facing windows. Reacting to changes in the sun's position, dynamic systems optimize the flow of heat and light energy through the façade which, in turn, can contribute to reducing heat load and glare, and boosting natural daylight.

Screens may continue to have value during the winter months when they can protect carpets, drapes and furniture, and reduce wind chill on the window surface. According to the Web site of manufacturer Phifer Incorporated, the screens can provide as much as a 15 percent increase in the thermal performance of the window during colder months. This helps to reduce heat loss in the building interior. Early tests were conducted in general accordance with ASTM C236-66 in which a 15-mile-per-hour (24-kilometer-per-hour) dynamic wind was applied perpendicular to a plane of 1/4-inch thick clear glass at the exterior; natural convection conditions were applied to the interior of the glass. Results showed that a 0.00 psf pressure differential was maintained across the specimen to insure measurement of conductive thermal transmittance only. Under these conditions the thermal transmittance, or U value, showed a 15 percent improvement, indicating that the tight weave of the screen was effective in reducing the wind chill factor on the glass surface to maintain warmer, more constant glass temperatures.

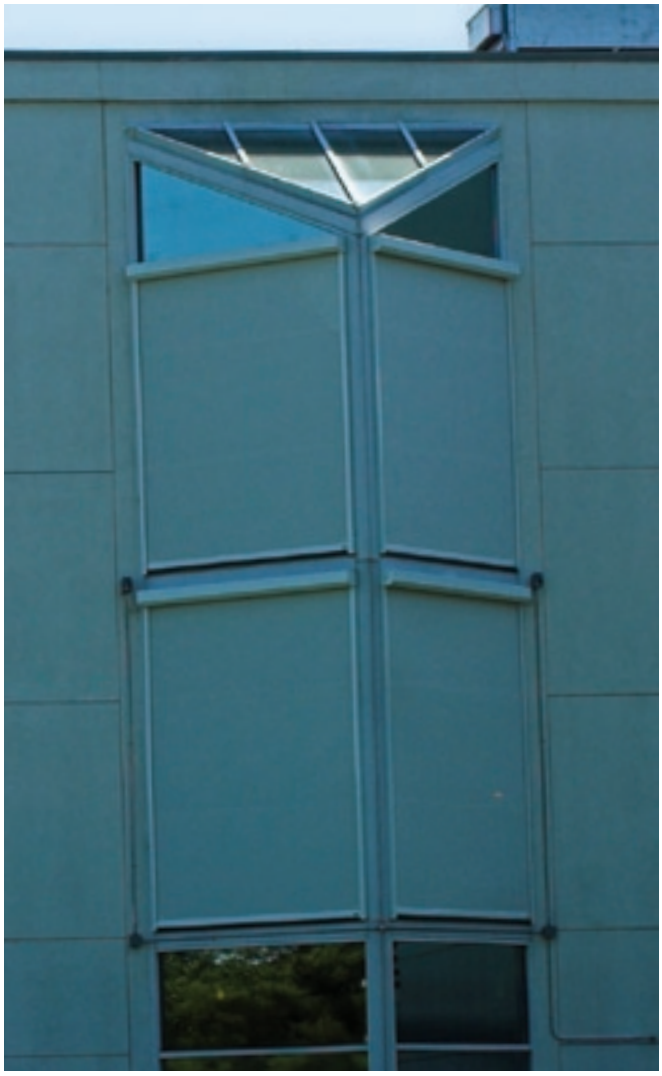
With automated systems, screens can be automatically lowered during winter nights to provide added insulation, or raised during summer nights to help cooling. In addition, allowing sun into the building when screens are retracted during the colder months can help harness the sun's radiant power when applicable.

According to architect d'Andre Willis, AIA, LEED AP, of HGA Architects in Milwaukee, the aim of a good daylighting strategy is to use natural light during the day so as to dim or entirely turn off banks of electric lights, while guarding against excessive heat gain and glare. "It's great to have a connection to the outdoors," Willis says. "But if it's not controlled, it can be tough on the people inside. It's important not to 'over' light a space."

Dynamic systems such as retractable screens perform well on south-facing as well as on east- and west-facing windows.

That was the situation faced by a Honda dealership in British Columbia. With 20-foot-high (6-meter-high) ceilings in a glass front south-facing showroom, glare and heat became considerable problems. To shade the interior and reduce glare and heat gain, externally-mounted, oversized motorized retractable screens were installed. Black mesh was used with an openness factor of 10 percent, and UV blockage of 90 percent. "The screens have made a huge difference in heat stoppage and glare reduction," says

Retractable screens help shade the showroom of a Honda dealership. (Photo courtesy of Phantom Screens.)



Automated retractable screens with sun and wind sensors deploy retractable screens to minimize solar heat gain at the Gordon Head Recreation Center.
(Photo courtesy of Phantom Screens.)

Owner and General Manager, Manse Binkley. Binkley notes that the screens have been operating at the dealership for more than seven years without requiring mesh replacement or other repair. "The mesh is very durable, and there is no problem when it snows," he says. "We lubricate the channel about once a year to keep the screens operating smoothly. The screens have made a difference in the dealership."

The District of Saanich in Victoria, British Columbia, also faced a heat gain issue at the Gordon Head Recreation Center. The center's west-facing wall of windows allowed excess sun into the pool area on sunny afternoons resulting in an uncomfortable heat buildup inside. Retractable oversized power screens with 90 percent sun and UV blockage and a 10 percent openness factor were installed on six of the eight west windows. A completely automated system with a sun and wind sensor was also installed to monitor the amount of sunlight and deploy the screens prior to the sun hitting the west side walls and allowing the solar heat gain to occur. The sensor also retracts the screens during periods of excessive winds, a condition that the staff was having difficulty monitoring. "There is a noticeable difference in the temperature on the deck and an even bigger difference when the sun and wind sensors were installed," says John McKain, Building Service Worker II Supervisor at the Gordon Head Recreation Center.

SUSTAINABILITY AND OTHER DESIGN CONSIDERATIONS

Retractable screens contribute to sustainability in a number of ways.

Lowering the Shading Coefficient

Expressed as a decimal between 0 and 1, shading coefficient represents the percentage of solar heat gain that is transmitted through a shading system into a building, compared to that of a single pane of clear 1/8-inch (2.54-centimeter) glass. The lower the shading coefficient, the lower the heat gain through the material, and thus the better the solar control performance. A typical low-E glass would have a shading coefficient in the area of .3.

A black screen mounted externally that has a 25 percent openness factor will deliver similar solar heat gain coefficient results to an oyster/beige screen mounted internally that has a 5 percent openness factor. The advantage is that the black exterior screen will be much easier to see through and it will also absorb glare, whereas the light colored interior screen will produce glare.

Architects can consult manufacturers for information about how screens improve the shading coefficient of clear and heat absorbing glass as well as information on optical properties of products. (Refer to figures 1 and 2 on the following page.)

Visibility and Views

Retractable screens have differing levels of opaqueness, or openness. The openness factor refers to the density of the weave, and is the percentage of open area to the total area of the fabric. The higher the screen's openness factor, the clearer the outward view and the better its ventilation potential — but the more solar heat and glare it will transmit. Conversely, lower openness screens block more UV rays, but the view or ventilation won't be as good. As view quality increases, UV ray blockage decreases. A screen with a 25 percent openness factor, for example, may offer a superior view, but block only 75 percent of the UV rays, while a screen with an openness factor of 5 percent will block 95 percent of UV rays or more, but the view won't be as clear.

In windy areas, unless there is a solid structure behind the screen, it is advisable to select a more open mesh that allows the breeze to travel through it, reducing the chance of excessive tension on the screens.

SUSTAINABILITY BENEFITS OF RETRACTABLE SCREENS

Retractable screens contribute to a sustainable building in several ways.

Improved Daylighting

By reducing glare and heat gain, manually and motorized retractable screens add to a building's daylighting strategy. Retractable screens can easily be used only when they are needed so daylight

Figure 1 is typical of the level of information architects can expect from manufacturers. As can be seen here, the addition of a retractable screen can offer considerable improvement in shading coefficient of the window unit when applied in conjunction with insulating glass.

Figure 1

Solar Heat Control Properties of Mesh with 25% Openness

(based on external installation and thirty-degree profile angle)

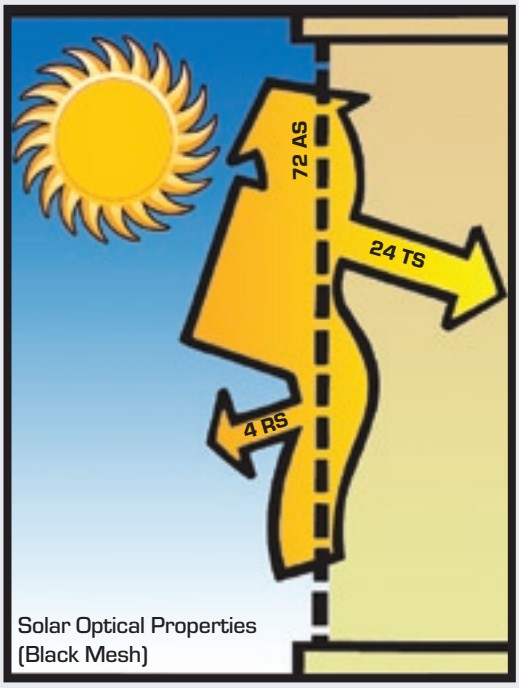
	SOLAR OPTICAL PROPERTIES			SHADING COEFFICIENT W/ SINGLE			INSULATING		
MESH COLOR	TS	RS	AS	1/8 CL	1/4 CL	1/4HA	1/2 CL	1 CL	1 HA
Brown	22	5	73	0.31	0.31	0.29	0.26	0.26	0.23
Black	24	4	72	0.33	0.33	0.28	0.28	0.27	0.24
Grey	26	24	50	0.33	0.32	0.28	0.28	0.27	0.24
Stucco	35	34	31	0.4	0.39	0.36	0.42	0.37	0.31
Beige	29	31	41	0.34	0.33	0.31	0.29	0.286	0.25

Data based on performance evaluations conducted by Matrix, Inc. (Mesa, AZ)
The solar optical properties are used to calculate the shading coefficient.

KEY: TS = solar transmittance
RS = solar reflectance
AS = solar absorption
1/8 CL = 1/8" clear glass
1/4 CL = 1/4" clear glass
1/4 HA = 1/4" heat absorbing glass
1/2 CL = 1/2" clear glass
1 CL = 1" clear glass
1 HA = 1" heat absorbing glass

NOTE:
TS (solar transmittance) is percentage of heat passing through mesh.
RS (solar reflectance) is percentage of solar heat being reflected.
AS (solar absorption) is percentage of solar heat absorbed by screen.

Figure 2



Courtesy of Phifer Incorporated.

can be maximized, which offers significant payoffs in energy efficiency via less artificial lighting and less air conditioning to counteract the electric lighting load; as well as in improving human performance and well being. This is also true for motorized retractable screens being used on the exterior for solar control — the user has the ability to control daylight.

According to the U.S. Department of Energy's Federal Energy Management Program, daylighting can significantly cut lighting energy use for building interiors, by as much as 75 to 80 percent, depending on the application. Daylighting is also known to have a salutary effect on a wide range of human activities. Studies by the Heschong Mahone Group have shown students increase their test scores in daylighted classrooms, sales increase in daylighted retail stores, and productivity increases for office workers.

In her paper "Investing In People: The Social Benefits of Sustainable Design," Judith Heerwagen Ph.D., Principal, J.H. Heerwagen & Associates based in Seattle, finds buildings that incorporate a connection to nature and natural sunlight improve occupants' well-being, stress levels, cognitive performance, and satisfaction with life and work.

So important is daylighting that it is now either required or encouraged in certain instances by a host of national and state organizations including California's Title 24 energy code, the Oregon Energy Code, LEED-NC v.3, Northeast Collaborative for High Performance Schools, ASHRAE and countless other organizations. The latest generation of codes such as International Energy Conservation Code 2009 and Title 24, ASHRAE 90.1-2010 and ASHRAE 189.1 are beginning to require daylighting control — an area where retractable motorized screens can form part of the solution.

California Title 24 energy regulations were updated in 2008 with new building energy efficiency standards that require day-lit areas near windows for some types of buildings, and expand the definition of daylit area and the requirements for daylighting controls and sensor requirements to include smaller buildings. Retractable screens may have applicability here (see Section 131).

In 2008, the American Institute of Architects (AIA) launched its "Walk the Walk," campaign to educate, promote and encourage sustainable design among consumers, business owners and architects. A key part of this multifaceted program is 50 to 50, a resource to assist architects move toward AIA's goal of a minimum 50 percent reduction of fossil fuel consumption in buildings by 2010 and carbon neutrality by 2030. Retractable screens have applicability in the following 50 to 50 categories:

- Daylighting
- Efficient Artificial and Site Lighting
- Natural Ventilation
- Open Active, Daylit Spaces
- Smart Controls
- Sunshading
- Windows and Openings

Retractable screens offer solutions in several of the LEED-NC v3 categories. Reducing energy consumption and related carbon emissions is the most important criteria within the USGBC LEED rating systems, and the Optimization of Energy Performance category (EA Credit 1) is the highest single area for achieving LEED points on a project. Credits are earned for reducing energy use —

MOTORIZED, RETRACTABLE SCREENS: LEED POTENTIAL

Motorized retractable screens have the potential to contribute to LEED v3 credits in New Construction in the following areas:

Energy and Atmosphere
EA Credit 1 - Optimize energy performance

Indoor Environmental Air Quality
IEQ Credit 2: Increased Ventilation
IEQ Credit 4.2 Low-Emitting Materials: Paints and Coatings
IEQ Credit 6.2: Controllability of Systems — Thermal Comfort
IEQ Credit 7.1: Thermal Comfort — Design
IEQ Credit 8.1 Daylight and Views — Daylight
IEQ Credit 8.2 Daylight and Views — Views

and with their ability to reduce daytime glare and the amount of air conditioning required to cool building interiors, retractable screens offer potential to contribute to LEED credits in several areas.

Saving Space by Maximizing the Natural Environment

Blending indoor and outdoor spaces to create multi-purpose areas is emerging as a trend in commercial design projects. The prospect has applicability to a wide range of commercial situations, from hospital visiting and health care patient areas to restaurant patios, indoor pools, and the like. For virtually any owner that can envision extending working, recreational, dining or entertaining spaces, design professionals can make outdoor spaces more livable through the use of retractable screens to creating outdoor 'rooms' that afford airflow without insects.

Retractable screens provide natural ventilation and insect protection to diners. (Photo courtesy of Phantom Screens.)

These outdoor rooms can be fine-tuned for sun and privacy control with different kinds of mesh. Moreover, the improved use of existing spaces reduces the need for additional square footage and associated expenditure of resources, both natural and financial.

Retractable screens may also be a good solution to meeting the requirements of Section 6-202.15 of the U.S. FDA Food Code., which stipulates that outer openings of a food establishment must be protected against entry by insects and rodents. Retractable screens resolve the issue of what to do with the fixed screens when they're not needed during the off season.

Reducing Glare

Glare in interior environments, particularly office situations, is a growing problem and a leading cause of eyestrain and other vision difficulties. It stems from over illumination from lamps, overhead lights, and particularly sunlight that reflects onto computer screens, "washing out" the screen image and forcing the eye muscles to strain constantly in an effort to refocus and regain clarity. Upper neck and head muscles are taxed as well as tilting the head and neck to seek better views from different angles is prevalent among computer operators.

Windows are a major source of glare in many buildings, though a proper daylighting strategy can offer significant glare reduction. In swimming pool environments, glare is a perpetual problem, and one of the chief obstacles to a safe swimming environment. If left uncontrolled, glare can pose serious safety issues as it interferes with lifeguards' ability to see beneath the surface of the water, impairs their concentration and causes fatigue. The Gordon Head Recreation Center's McKain found that retractable screens helped solve the glare problem for his lifeguards.

"Something that we weren't expecting was in the evening when the sun is setting the lifeguards were having great difficulty seeing across the deck because of the glare off the water," he says. "The screens have made a huge difference and have greatly increased the safety of the patrons."

The Benefit of Views and Natural Ventilation

The fact that retractable screens afford views to the outside even when drawn, and restore unobstructed views when not needed is no small advantage. More than just a pleasantry, views of nature have been shown to affect human health and well being. That humans deeply respond to and benefit from contact with nature is espoused by Harvard biologist Edward O. Wilson in his 1984 book, Biophilia: The Human Bond with Other Species. Biophilia is defined as "the connections that human beings subconsciously seek with the rest of life." For the built environment, biophilia translates to design features like natural ventilation and opportunities to interact with nature both physically and visually.

In health care facilities, such as hospital visiting areas and patient areas, views of nature were determined to be health affirming and confer significant benefits on ill patients. According to Roger Ulrich, professor and director of the Center for Health Systems and Design at Texas A&M's College of Architecture, the idea that nature offers benefits to ill people is centuries old

Retractable screens helped minimize glare and make a safer swimming environment at Gordon Head Recreation Center. (Photo courtesy of Phantom Screens.)

and widely held in all cultures. Among the advantages that views of nature and gardens can have are lower stress and anxiety in patients, visitors and staff as well as reduced depression and better quality of life for chronically ill patients, and even reduced pain in patients.

Ulrich notes garden-like scenes can reduce pain as indicated both by patients' perceived pain and requests for pain-relieving medications. According to Ulrich, studies have shown that patients in hospital rooms with morning sunshine need pain medication about 23 percent less than patients in rooms with dull, shadowy afternoon light. In his research on 46 hospital charts of gallbladder-surgery patients, where half the patients received rooms with a window looking to a small grove of trees, and the other half a brick wall, Ulrich found a significant difference in outcome. Those with the views of trees went home sooner, were less upset, had fewer complications, and required less pain medication.

As efforts are made to create non institutional health care environments, patient rooms, in particular, are being designed to connect with the outside world. Operable windows and screens that offer insect and glare protection — and then retract to restore unobstructed views — can be part of that scenario.

Greg Mare, AIA, Principal at Anshen + Allen, an international architectural practice in healthcare design, finds a growing acceptance of exterior screens to afford insect protection and ventilation. "On every project we have a discussion about screens. Some clients need to have evidence of engineering scenarios, particularly that the operable windows won't upset the HVAC balance. And in every example, and in our own engineering research, integration of operable windows with the HVAC system has not been an issue," says Mare, who reports that feedback from patients and their families has been overwhelmingly positive. "They appreciate the opportunity to have fresh air." Retractable screens could also have the added benefits of less dust and maintenance for clean environments.

Mark Perepelitza, AIA, LEED AP, an associate partner at ZGF in Portland, also notes a gradual trend toward more operable windows as architects try to design increasingly sustainable buildings. "As operable windows are more accepted to provide natural ventilation, in some parts of the country retractable screens will be part of the equation to protect from insects, especially for building types such as hotels and condominiums," says Perepelitza, who also notes screens' role in reducing solar heat gain and glare.

Insect Protection for a Healthy Environment

In addition to their annoyance factor, insects can pose health challenges. Mosquito-borne diseases are among the world's leading causes of illness and death today. The World Health Organization estimates that more than 300 million clinical cases each year are attributable to mosquito-borne illnesses. The Centers for Disease Control (CDC) says that the West Nile virus first appeared in North American in 1999 and has since been reported throughout Canada, Mexico, the Caribbean and Central America, and in all U.S. states except Hawaii, Alaska, and Oregon.

According to the Maryland Department of Agriculture, vectors of all major mosquito-borne disease continue to thrive in the United States and with the decline of vector control programs, mosquito-borne diseases are a growing threat throughout the Americas. The department further states that for the first time in

Retractable screens used in conjunction with a folding wall system keep diners comfortable. (Photo courtesy of Phantom Screens.)

nearly 50 years, endemic cases of dengue fever and malaria are in the United States. The CDC identifies properly installed screens in good repair as one way to address the mosquito problem.

Insect screens can dramatically impact the look of the building facade — especially if wickets are used in order to access window handles. All types of screens will prevent insects from entering so the reason for specifying a retractable screen versus a fixed screen stems from other benefits: clean aesthetics and maximizing daylight when not in use. With their simple clean lines, retractable screens have a more pleasing, uniform appearance than fixed screens that permanently darken glazing.

COMPONENT PARTS

Architects interested in specifying sustainable materials should have an understanding of the component parts of retractable screens.

Mesh and Durability

Most motorized retractable screens are made of either high-strength fiberglass or polyester yarn that is interlocked, heat-treated for secure bonding and coated with a vinyl compound that has been engineered for durability, fire and fade resistance, soiling and general wear and tear. When PVC coated fiberglass is woven together, it creates a material with high tensile strength, high heat resistance; inherent flame resistance; dimensional stability; chemical resistance; and low moisture absorption. Fiberglass yarns are manufactured from natural minerals, including quartz, sand, soda and lime, which are non-toxic. The strength of both polyester and fiberglass mesh adds to the durability of the product and thus its sustainability.

Mesh products undergo weatherization tests (TMS-TM-003) for colorfastness. The test is used to determine the change in color (fading) when exposed to various weathering conditions such as heat, rain and humidity. The standard for the industry is 1200 QUV hours. The change in color is evaluated according to the American Association of Textile Chemists and Colorists according to a chart with degrees of shading in gray (gray scale); 1 is the most dramatic change and 5 rated as no change. Architects should note that 4 is a slight change and is the value assigned to many sun control products.

A few maintenance procedures are worth noting. Though mesh does not absorb water, rain may adhere to it. The brush system hidden near the roller will eliminate some moisture but consideration should be given to drainage if a recessed cavity is designed. Although agents are added to the vinyl formulation to resist the growth of mold and mildew, some environments are more conducive to mildew growth than others. For instance, a rolled up, wet shade in the humid Florida climate would probably be more prone to mildew growth than a shade in Phoenix, Arizona. Usually the origin of the mildew is from a source of contamination that offers a breeding ground for the organism; it can be removed by washing the screens with a mild dish detergent and warm water solution.

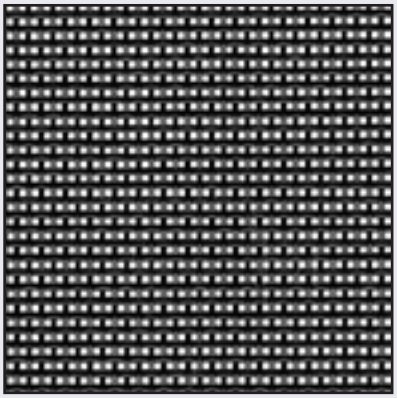
Choosing Material That is Recyclable and Non-Toxic

Typically the exposed hardware — including housing, slidebars and tracks — of retractable screens — is constructed of extruded aluminum which is generally powder coated in various colors. Unlike liquid paint, a powder coating does not require a solvent and so emits zero or near zero volatile organic compounds, which have a range of health consequences. Powder coatings also result in thicker coatings without runs or sagging, and because the overspray can be recycled, achieving nearly 100 percent use of the coating is possible.

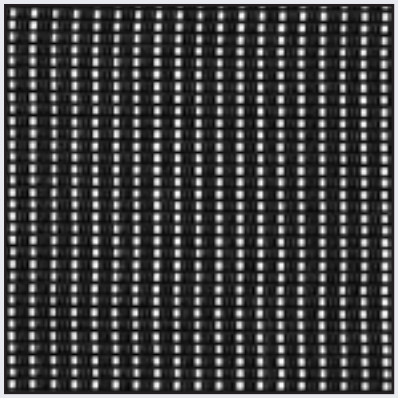
Aluminum is light, strong, durable, noncorrosive, low maintenance and one of the most abundant elements in the earth's crust. While aluminum consumes more energy than most building products during manufacturing, its end use products result in some of the most energy-efficient available.

MAINTAINING RETRACTABLE SCREENS FOR INCREASED LONGEVITY

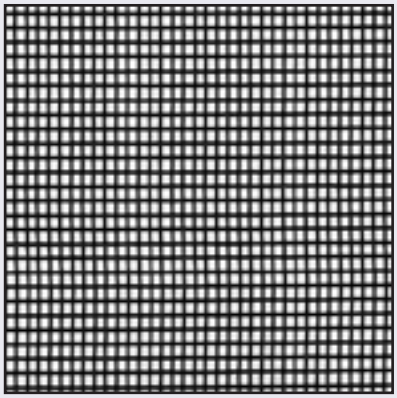
While retractable screens are typically a low maintenance product, some issues are worth noting to ensure longer product life. Screens should be retracted into protective storage housings



25% Openness Factor
Fabric with mesh count of 17 x 14



25% Openness Factor
Fabric with mesh count of 57 x 16



60% Openness Factor
Typical Insect Mesh

Mesh comes in various weaves and openness factors.
(Photos courtesy of Phifer Incorporated.)

when not in use. Objects left under a motorized unit can prevent the unit from lowering. Should this occur, the slide bar should be lifted manually, the obstacle removed, and the slide bar lowered. Interruption of power will not erase the memory of the control program.

Tracks should be kept free of dirt and debris which may cause the screen to perform poorly; they should be periodically cleaned and lubricated. Mesh fabric, housing tracks and slide bar can be cleaned with water and a soft brush but not with a pressure washer. A mild detergent can be used, but not chemicals.

Motorized units should be retracted in winds in excess of 25 miles per hour (40 kilometers per hour) as the wind load may affect the ability of the unit to extend or retract. The screens should never be used solely for the purpose of a wind break. Neither should snow or ice be allowed to accumulate on the fabric or tracks. The motorized screens should not be used in temperatures under 14 degrees F. (-10C), although they can be operated infrequently at -4 degrees F (-15C).

SPECIFYING EARLY FOR MAXIMUM EFFICIENCY

With the realization that controlling the levels of light and heat entering a building can reduce operating costs, make buildings more comfortable, and occupants more productive, a building façade is more than an aesthetic solution and should be approached in a more holistic way.

The benefits of specifying automated solar shading from the design stage are clear. Motorized retractable screens are an engineered product that should be considered early on so that components can be integrated into the structure. For new construction, the roller and motor assembly, and often the track as well, can be recessed into the building design so that they become invisible. Dimensions of the cavity must be specified by the manufacturer but range from 4 inches (10 centimeters) to 6 ½ inches (16 centimeters) deep by 6 ½ inches (16 centimeters) to 10 inches (25 centimeters) high in order to hide the roller assembly and bottom slide bar. An access panel must be provided for the full width of the unit in order to service the motor and screen.

A SUSTAINABLE OPTION

As architects continually move to design buildings with reduced carbon footprints and greater connection with the environment, the ability to maximize effective daylighting, natural ventilation and views to the outdoors will all assume increasing significance. Because of their functionality in all these areas, retractable screens will be viable options across all building types to contribute to architecture that reflects the principles of sustainability and human health and well being.

See Quiz on the Next Page

or

Take the Quiz Free Online

(Photo courtesy of Phantom Screens.)

This article also appears online at ce.greensourcemag.com

Program title: **"Comfort on Demand"** (11/09). AIA/CES Credit: This article will earn you one AIA/CES LU hour of health, safety, and welfare/sustainable design (HSW/SD) credit. (Valid for credit through November 2011). **Directions:** Refer to the Learning Objectives for this program. Select one answer for each question in the exam and fill in the box by the appropriate letter. A minimum score of 80% is required to earn credit. **To take this test online and avoid handling charge, go to ce.greensourcemag.com**

1. In terms of blocking solar heat gain, how do exterior shade systems compare to interior systems?
- ❑ **a.** they are more effective
- ❑ **b.** they are less effective
- ❑ **c.** they are equal
- ❑ **d.** the difference is negligible

2. During colder months what effect do screens have on the thermal performance of the window?
- ❑ **a.** a 50 percent increase
- ❑ **b.** a 25 percent decrease
- ❑ **c.** a 15 percent increase
- ❑ **d.** no effect

3. A black exterior screen will produce glare, and a light-colored interior screen will absorb glare. True or false?
- ❑ **a.** True
- ❑ **b.** False

4. When applied in conjunction with insulating glass, a retractable screen:
- ❑ **a.** improves the openness factor
- ❑ **b.** improves the shading coefficient of the window unit
- ❑ **c.** causes glare
- ❑ **d.** generates excessive heat

5. A screen's openness factor refers to its:
- ❑ **a.** color
- ❑ **b.** length and width
- ❑ **c.** UV blockage
- ❑ **d.** density of weave

6. Most motorized retractable screens are made of:
- ❑ **a.** wire
- ❑ **b.** wire or fiberglass
- ❑ **c.** fiberglass or polyester yarn
- ❑ **d.** fiberglass

7. Mesh products undergo weatherization tests (TMS-TM-003) for:
- ❑ **a.** durability
- ❑ **b.** colorfastness
- ❑ **c.** moisture absorption
- ❑ **d.** heat resistance

8. Unlike liquid paint, a powder coating does not require a solvent and so:
- ❑ **a.** emits substantial volatile organic compounds
- ❑ **b.** emits zero or near zero volatile organic compounds
- ❑ **c.** results in thinner coatings
- ❑ **d.** has no overspray

9. Mesh fabric, housing tracks and slide bar can be cleaned with:
- ❑ **a.** water and a soft brush
- ❑ **b.** a pressure washer
- ❑ **c.** chemicals
- ❑ **d.** warm water only

10. Motorized screens should not be used in temperatures:
- ❑ **a.** over 100 degrees F (38C)
- ❑ **b.** over 122 degrees F (50C)
- ❑ **c.** under 4 degrees F (-15C)
- ❑ **d.** under 14 degrees F (-10C)

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Material resources used: Article: This article addresses issues concerning health and safety and sustainable design.

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