

3form. Translucent panels from the Varia Ecoresin line allow for a range of daylighting uses in walls, partitions, and doors, or at the ceiling to soften rays from a skylight. Made with Ecoresin, a material with 40 percent post-industrial recycled content, the panels come in a variety of gauges, textures, and colors, and with varying levels of light diffusion. 801-649-2500. www.3-form.com. Circle 150.

Technical Glass Products. Pilkington Profilit channel glass can be formed into straight or curved walls for interior or exterior applications. The self-supporting glass is available in a variety of textures and colors with varying translucency, allowing light through while maintaining privacy. Nanogel Aerogel insulation can be added for a soft, even dispersion of light and enhanced energy efficiency. 800-426-0279. www.tgp-america.com. Circle 151.

Let There Be Light

SMART DAYLIGHTING STRATEGIES KEEP HOMES BRIGHT AND ENERGY EFFICIENT.

Basement living spaces need all the sunlight they can get. So when Washington design/build contractor Chris Landis' clients asked for an outdoor deck that wouldn't block light into the window wells of their downstairs family room, he came up with a novel solution: a deck with a translucent floor made out of Chroma load-bearing fiberglass panels from 3form. "They let light through to below, like a skylight you can walk on," he says.

Good daylighting strategies—the use of natural light to brighten up a home's interior—are increasingly in demand, especially for builders like Landis who work in mature urban and suburban neighborhoods where trees and nearby buildings often obstruct sunlight. The psychological benefits of natural light are well-documented, but daylighting also is fundamental to green building. By limiting the need to turn on lights during the

day, a well-designed, daylit building is estimated to reduce lighting energy consumption by 50 percent to 80 percent, according to the USGBC.

MULTITUDE OF OPTIONS

Achieving proper natural illumination means more than simply cramming in as much glass as possible, however. It's a balancing act—part art, part science—that takes into consideration orientation and climate, window size and placement, and the color and location of interior walls.

The goal is to maximize the amount of natural light entering the house, while minimizing glare and heat gain or loss. "You want to let in just the right amount of light and nothing more," says G.Z. Brown, professor of architecture at the University of Oregon

School of Architecture, Eugene, and co-author of *Sun, Wind & Light: Architectural Design Strategies*.

A good daylighting strategy starts with a house's layout and orientation to the sun. Southern exposures receive the most light, so a house should be sited with the long axis running east-west, which also minimizes afternoon glare. And the more narrow the building, the better. Houses one room deep with light on at least two sides allow for the most abundant and balanced natural light. Once the floor plan is designed, light can be added from the top with skylights or tubular devices, and from the side with windows and clear or translucent doors and walls.

Measuring the amount of natural light in a room takes some calculation. LEED-NC, which applies to commercial buildings and residential projects of four

By Cheryl Weber



PHOTO: RICHARD BOYD

Duo-Gard. Translucent illumawall is made of polycarbonate or resin art panels that transmit diffused natural light. At night, integral LEDs can be programmed to change colors. Pictured is a meditation room designed by the Virginia Tech School of Architecture for ABC's *Extreme Makeover: Home Edition*. The double-glazed walls filled with Nanogel Aerogel (optional) achieve R-10 with high light transmission. 800-872-4404. www.duo-gard.com. Circle 152.



Pella. Designer Series windows are available with triple-pane glass, which the company says can cut a home's heating and cooling bills by nearly a third. Between-the-glass blinds and shades let homeowners adjust light levels and are protected from dirt and dust. Cellular shades come in 15 colors and offer top-down or bottom-up light control. 800-374-4758. www.pella.com. Circle 154.



Huvco Daylighting Solutions.
800-832-6116. www.huvco.com. Circle 155.

Plugging Into the Sun

Hybrid solar is an elegant new technology that uses solar collectors to track and magnify the sun's rays, which are then channeled through flexible fiber-optic bundles to hard-to-reach interior rooms. "The sunlight is concentrated about 400 times, so the opening required in the roof is much smaller than it would be for a skylight to bring in the same amount of light, resulting in fewer thermal and moisture leaks," explains Curt Maxey, senior research engineer at Oak Ridge National Laboratory, which pioneered the technology for commercial use.

The residential equivalent is the Swedish-made Parens fiber-optic skylight. It consists of a wall- or roof-mounted panel, about 3 feet square and 8 inches deep, fitted with 64 Fresnel lenses—scaled-down versions of those used in lighthouses. An internal fan circulates air to prevent heat buildup, and filters eliminate UV and infrared wavelengths. The fiber-optic cable can reach 60 feet into a house. "Unlike tubular skylights, the fiber optics are not affected by being bent and rotated," says Eric G. Huffman, vice president of Huvco Daylighting Solutions, which distributes the system.

With a retail cost of about \$10,000, hybrid solar is being marketed to high-end homes.—C.W.



or more stories, calls for a minimum 2 percent glazing factor, which is the ratio of interior light to exterior light on an overcast day. It's calculated by a formula involving window area, floor area, window geometry, light transmittance, and window height (window areas above 7 ½ feet are the most effective at dispersing daylight deep into interiors). Computer simulation also is used to measure light, with a goal of at least 25 footcandles. Although LEED practitioners have applied these standards to houses, it is balanced—rather than uniform—light that's most important in a home.

"We use Google Sketchup or a heliodon to do direct sun studies, but we aren't doing daylight calculations for single-family homes," says Dan Johnson of Arkin Tilt Architects in Berkeley, Calif. "It's more of an artistic concept—about the balance of northern and southern light and how it penetrates the house."

Skylighting is twice as efficient at letting in light as side lighting, Brown says, but the light is harder to control. Daylighting consultant Matthew Tanterri, president of Tanterri & Associates in New York, agrees. "One of the biggest mistakes I see in residential buildings is the gratuitous use of skylights without understanding the solar heat gain implications."

As a rule of thumb, skylight size should never be more than 5 percent of the floor area in rooms with many windows, and no more than 15 percent of the room's floor area in spaces with few windows, according to the Department of Energy Office of Energy Efficiency and Renewable Energy.

MAXIMIZE EFFICIENCY

As important as calculating daylighting efficiency is ensuring that all that extra glass isn't sending energy use through the roof.

In recent years, window and skylight manufacturers have addressed thermal conductivity issues by offering a range of shading options and high-performance technologies such as low-E coatings; dual, triple, and laminated glass; and thermally broken frames.

Energy ratings take some of the guesswork out of specing climate-appropriate glazing. ASHRAE Standard 90.2 establishes minimum residential requirements for U-value and solar heat gain coefficient (SHGC) by climate zone. And the National Fenestration Rating Council labels manufacturers' products for U-value, SHGC, and visible transmittance (VT), or the amount of visible light transmitted through a window assembly. Most values fall between 0.3 and 0.8; the higher the VT, the more light is

Solatube. Daylighting goes multifunctional with the ventilation add-on kit, for use in moist areas like baths and laundry rooms. The fan, which turns on with a switch, attaches seamlessly to the 160 Daylighting System, which illuminates up to 200 square feet, or the 290 DS, which lights 300 square feet. 888-765-2882. www.solatube.com. Circle 153.

Velux. The electrochromic SageGlass skylight can be tinted with the touch of a button, reducing solar heat gain by 75 percent while maintaining the sky view. An automatic timer lets users program the glass to darken during specified times of the day.

The glass has a double low-E coating that's balanced to let in natural light while limiting solar gain. 800-888-3589. www.veluxusa.com. Circle 156.



transmitted. Manufacturers of translucent solutions such as polycarbonate also typically list VT levels for their products in varying thicknesses and tints.

San Francisco builder David Warner, owner of Redhorse Constructors, takes performance measures a step further. He often sends a physical house model to Pacific Gas & Energy, the local utility, to evaluate daylighting effects. "They will model your project with light all day and give you back a film showing how light penetrates your structure," he says.

Brown predicts the next decade will deliver more daylighting products with advanced coatings and smart glass that responds to the light level. "These technologies exist now; it's just a cost question," he says.

In the meantime, pros have plenty of high- and low-tech options to keep homes bright and open while maintaining aesthetics and optimizing energy efficiency. **BP**

For more manufacturers of and information on windows, visit www.ebuild.com.



NanaWall Systems. The Segmented Curves vanishing glass wall system on this California home has nine angle changes, bringing in more daylight than a flat wall while redefining the boundaries between indoors and out. The Energy Star-rated glass, which balances solar gain and U-value, is held in an SL70 thermally broken aluminum-frame folding system. 800-873-5673. www.nanawall.com. Circle 157.

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