The Unintended Consequences of Going Green

NOBLE GOALS AND HIGH EXPECTATIONS MEET INCOMPLETE INFORMATION

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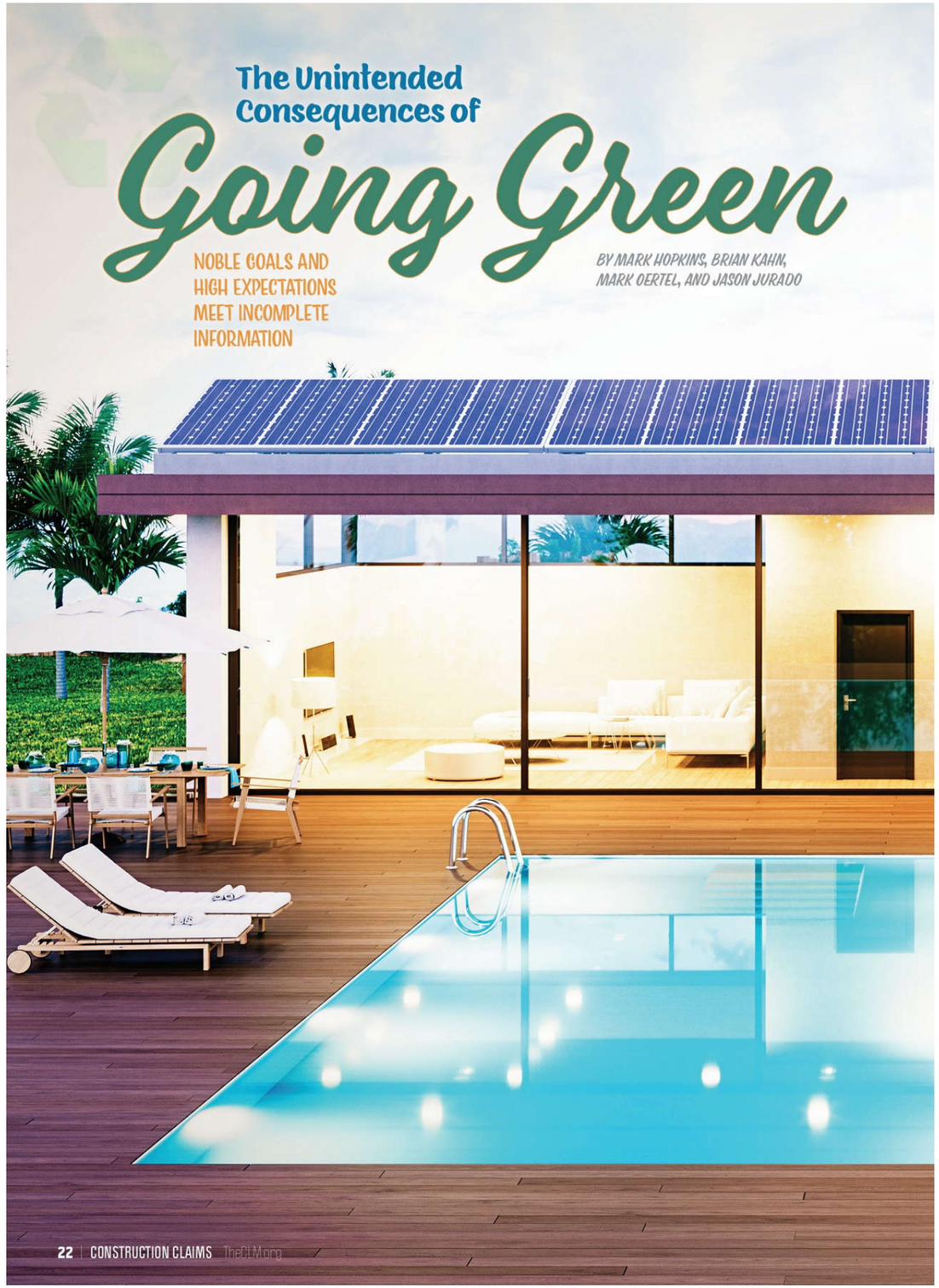

"Green" building has become more mainstream, and even mandated by local state and federal codes throughout the U.S. As going "green" expands, there is also a correlation in construction claims unique to "green" construction.

The greening of construction and improvements to the operational efficiency of our housing and infrastructure are important ideals. Leadership in Energy and Environmental Design, or LEED, is one of the first organizations to standardize green-building criteria and establish a certification process for buildings. This is the "green" standard with which most people are familiar. So, if one builds a LEED-certified building using green products and green techniques, what is the problem?

LEED certification is based on a system where a project can accumulate points based on the materials used, the orientation and shading of the building, and the means and methods used during construction. The certification level is a reflection of the number of points that project accumulated. There is no connection between LEED-certification levels and building operational efficiency.

The problem faced by design professionals is that it is very difficult to model the impact of a particular product selection in the performance of the building. For example, how a wall is framed, the type of insulation used, the exterior finishes, and the control system for HVAC all impact the energy usage of the building. The

difficulty of providing accurate performance models increases as the amount of new "green" products are utilized, particularly if the products interact with each other.

Many of these products are marketed with claims such as, "Up to 40 percent energy savings." If you purchased one of these products and only got one percent energy savings, is that considered good enough? Or even if the savings are five percent, 20 percent, or 30 percent? One must ask, "What are the building owners' expectations with regard to energy usage for the building for, say, a LEED Platinum building?" Problems and claims are arising when these expectations, or perceptions, are not being met.

For example, in a recent claim involving a large single-family home located in the Hollywood Hills of California, the homeowners installed solar panels on their roof and expected their energy costs to drop to zero. When costs remained the same, threats of litigation ensued against the solar-installation company. After analyzing the energy usage, it was found that the homeowners changed their behavior after the solar panels were installed. Prior to getting the solar panels, they kept the thermostat low for heating and high for cooling, lights were turned off, and electronics like computers were powered down when not in use. Post-solar panels, these energy-saving measures were abandoned, ostensibly on the presumption that power was now free. The reality is that these homeowners were using more power, and that was why their expectation for energy savings was not realized.

MANY OF THESE PRODUCTS ARE RECENT DEVELOPMENTS, AND LONG-TERM INSTALLATIONS DO NOT EXIST TO HELP US UNDERSTAND THEIR EXPECTED LIFESPANS.

Shedding Light on Solar

Staying with solar panels, the typical installation is on the roof. The location of the building and orientation of the roof relative to the sun's path year-round can significantly impact a solar panel system's performance. Some roofs may have reduced energy production as they are not optimal (installations along the coast with heavy fog, for example). Maintenance is an issue as well. Typically, solar panels must be washed twice a year to maintain optimal performance. If the panels are on the roof, then you need to have access them, as well as a source of water and the ability to safely scrub each panel clean. These panels use glass to protect the cell, which is black. Be careful to not wash the panels in direct sunlight as they can shatter.

Additionally, keep in mind that, in many cases, solar panels are being secured to what should be a watertight roof. Will the attachment points create a leak? Panels are typically installed on metal rails that expand and contract over time. This puts stress on these watertight connection points and can cause problems if these stresses are not managed. The rails themselves are hollow tubes, or pipes, which can conduct water under the roof membranes if not installed correctly.

On large commercial flat roofs, ballasted systems are used due to their ease of installation. A ballasted system is not secured to the roof by anchors, but rather by weight alone. This eliminates the risk

of a leak due to penetrations in the roof membrane. However, these system ride on flat pads. When the metal rails expand and contract, these pads move back and forth, riding on the roof membrane. Over time, it is possible for these pads to wear holes in the roof membrane. One manufacturer glued solar panels to interlocking foam panels, eliminating the rail system. However, the type of foam used was not compatible with the PVC roof membrane and chemically reacted with it, causing leaks.

Ballasted systems have another unique risk: If a seismic event were to occur, there is nothing to hold these racks in place. Solar systems run at high voltage, and the panels do not include an "off" switch. After a seismic event, the energized equipment may bump into other energized solar-system equipment or parts of the building.

The lack of an "off" switch also presents a problem with regards to firefighting. Energized electrical equipment and water do not mix. Fire department personnel will not access roofs with solar panels for fear of electrocution. As such, firefighting techniques are changed and could result in additional damage to the structure.

The common rectangular Solar Panel has a long performance history. These types of panels use glass to protect the solar cells and have a life expectancy in excess of 40 years. These panels, and the associated racks they are typically mounted on, are not the most attractive objects to look at. Manufactures have responded with solar shingles—a solar cell built into a shingle. The majority of these shingles use thin film technology to protect the solar cell. Essentially, a thin liquid coating, similar to a clear finish, is applied over wood. These types of coatings are prone to cracking and yellowing over time, with a typical lifespan of only 10 years.

Additional Products; Additional Considerations

Like thin-film technology, proven longevity is a problem for a number of green materials. Many of these products are recent developments, and long-term installations do not exist to help us understand their expected lifespans.

ACTUAL INSTALLATIONS IN THE FIELD HAVE FOUND FAILURES OF SYNTHETIC ROOFING IN AS FEW AS FIVE-TO-10 YEARS.

This is especially true of products that are manufactured from recycled materials—many green or synthetic roofing materials are manufactured from 100 percent recycled materials, and, from an environmental standpoint, this is a huge benefit. However, the expected lifespan of roofing materials varies from 50 years when manufactured from virgin materials versus 35 years for recycled. Actual installations in the field have found failures of synthetic roofing in as few as five-to-10 years. LEED awards zero points for virgin-produced products, but if the synthetic products end up in a landfill after a short period of time, then they were not necessarily "green."

Apart from variability in a product's lifespan based on the type of the raw materials used to produce them, the country of origin can also be a factor when considering a product's actual performance. The construction industry is keenly aware of numerous product failures from overseas suppliers, and the green industry is not immune from this phenomenon. Examples can include items such as wood flooring that is labeled to be compliant with indoor air-quality standards, but, in reality, contains high levels of formaldehyde; and electrical equipment with the Underwriters Labs (UL) label that is really not UL-compliant.

Besides non-compliant products, the overall performance can be diminished. The rectangular solar panel previously discussed typically has a 98-99 percent reliability rating from U.S. suppliers. For some overseas suppliers, that reliability rating can drop to 92 percent. Although this does not seem like a significant drop, when the building involved is a large warehouse with 2,000 panels, this performance decline can be costly.

In addition, consider that solar panels, when installed, are linked together like Christmas lights, and, like those lights, when one goes out they all go out. So even a small drop in reliability can have a large impact on power production. Warranty and product replacement can be problematic with overseas suppliers, and it is not possible to link different manufactured panels together.

Going green is here to stay, and it makes sense both economically and for the environment. But it is critical that design professionals and contractors manage customer expectations with regard to these types of products. Understanding the risks associated with a product's longevity and installed performance cannot be underestimated. Fail on one these points, and claims are sure to follow. ■

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