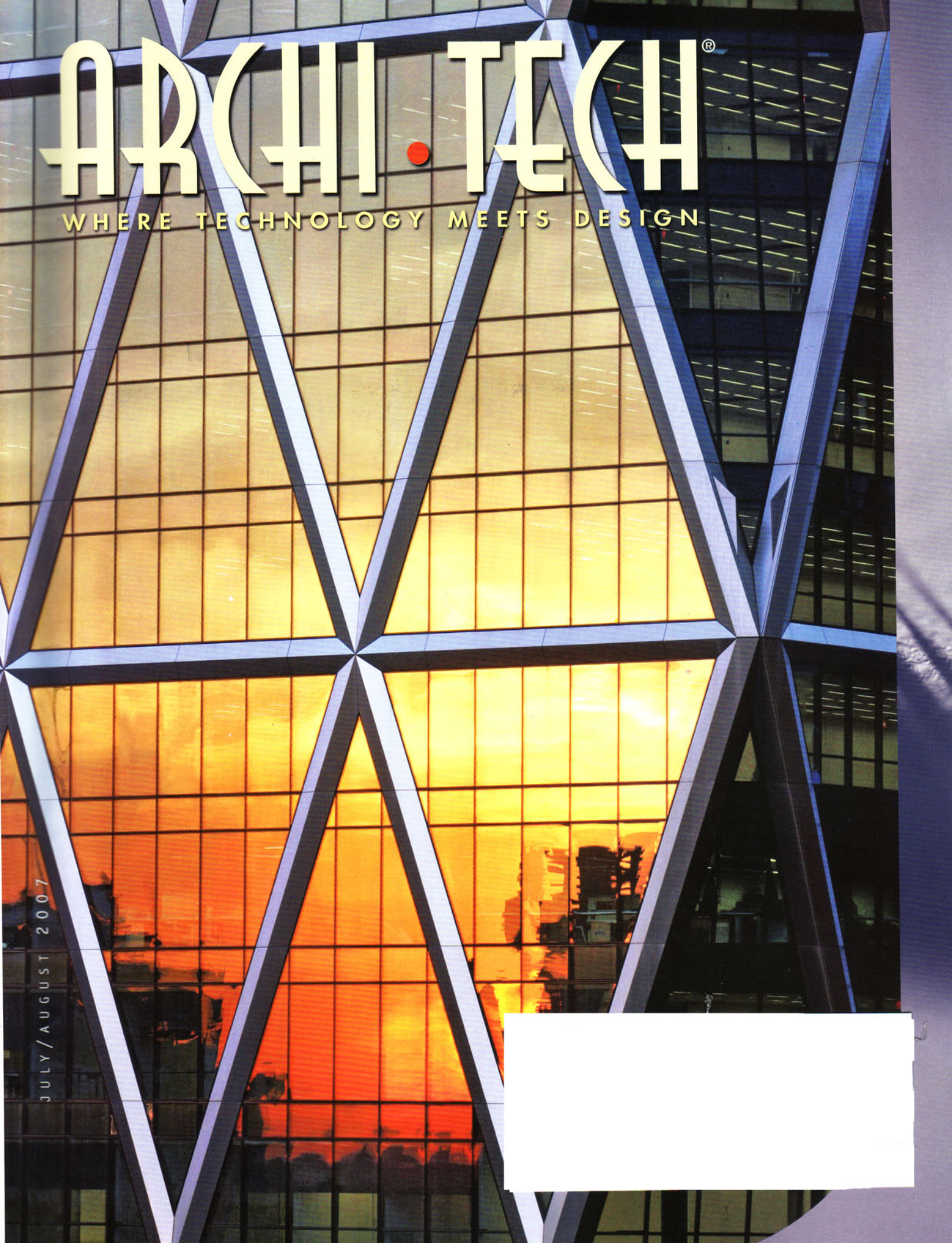
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JULY/AUGUST 2007

Green Buildings Require Holistic Design Strategy

By Paul M. Romano

Green buildings can create quandaries for designers. That's because some of the architectural features associated with green construction – such as lots of natural light and fewer man-made materials – can make a structure more difficult to operate efficiently and comfortably.

Windows can save on lighting costs, but they make indoor temperatures harder to control. Wood floors and other hard surfaces harbor fewer pollutants than carpeting but don't absorb noise as well. Fresh air is a welcome addition to any space, unless it's too warm or too cold.

To meet all the goals of green construction – including high energy efficiency, lower operating costs, and a pleasant, productive indoor environment – designers must carefully consider the integration of architecture with electrical, mechanical, and structural engineering. This holistic approach in the planning phase can help avert costly, and possibly difficult, corrective measures later on.

The Energy Factor

Rising energy costs and the threat of global climate change are fueling the boom in green construction practices. That's because buildings – especially public places such as schools, stores, and offices – are so expensive to operate. According to a recent report by the U.S. Green Building Council, nonresidential buildings consume nearly 40 percent of all energy used in the United States, including 70 percent of electricity.

Fortunately, architects have powerful new tools to help design the most energy-efficient buildings. Sophisticated computer programs can help determine the effects that natural ventilation, window placement, and other design decisions will have on heating and cooling needs.

The right HVAC controls also can have significant effects on the building's energy usage and comfort level. Today's advanced building automation systems continually gather detailed data about indoor conditions and automatically adjust the HVAC system to deliver optimal comfort levels with the lowest operating energy usage.

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A Sound Environment

Surface finishes factor heavily in the acoustic environment. It's important to balance hard, noise-reflecting materials with soft, absorbent ones to provide the ideal audible atmosphere.

Windows provide light but also can create acoustical problems because glass is more acoustically reflective than conventional walls. An acoustically pleasant indoor space is the result of all the sound sources impacting that space. To select the appropriate HVAC system and interior furnishings, an architect needs detailed sound data from product manufacturers. Using acoustical modeling tools, the designer can then determine what system will provide the best acoustical environment.

Airing It Out

Building codes require all commercial buildings to bring in fresh outdoor air to dilute the buildup of contaminants from the occupants and furnishings that accumulate indoors. Heating, cooling, and dehumidifying that air can be costly. This is driving some designers to use naturally-driven ventilation instead of mechanically-assisted systems. While this can undoubtedly save energy, designers must once again conduct a thorough analysis of the building's heating and cooling demands and accurate weather data and prediction tools to ensure occupant comfort goals are satisfied.

The HVAC selected for a green building should be a "smart" system that can measure and dynamically control the amount of outdoor air entering the building. Again, the right system will automatically ensure consistent comfort, regardless of the time of day or year.

More Tips for Designers

- Closely collaborate with system consultants, engineers, and other experts early in the design process.
- Select a product based on its life-cycle cost. For example, an HVAC system with the lowest price tag may cost more to operate in the long run.
- Select mechanical systems with accurate, complete sound data and analyze the effects of all the sound sources in the space. Consider how selected finishes will affect noise reverberation within the space ●

Paul M. Romano, AIA, LEED AP, is a senior research architect at the Center for Architecture and Building Science Research, New Jersey Institute of Technology. He leads the center's efforts to integrate innovations in technology and practice into building design and construction. He recently developed design criteria and procedures to attain "high-performance" schools for the state of New Jersey.