Report

Architecture, Style, and Design of Energy Efficient Buildings

Beyond Technology in the Pursuit of Energy Efficiency

For EEB Hub Principal Investigator Henry C. Foley, the first challenge to meeting the Hub's stated goal of reducing commercial building energy usage is not the invention of new technology, but rather "the adoption of the best existing technology to accomplish this goal." Given the very real role that aesthetics play in decision making, encouraging investment in the best existing technology prompts questions about the role of architecture, design, and style.

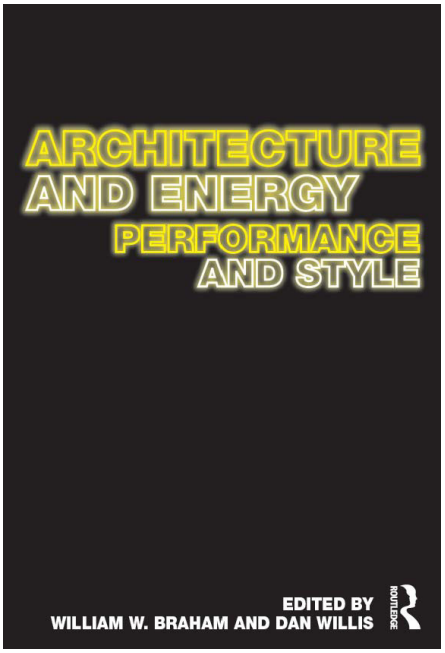
The Architecture and Energy event series brings together architects who are looking beyond specific technologies to the deeper influences that make buildings energy efficient.
Source: *Penn Design*

On January 27, 2012, a team of investigators from the EEB Hub convened a conference to explore the interaction between architecture, style, and design of energy efficient buildings; an edited volume titled "*Architecture and Energy: Style, Performance, and Design*" on the same subject will be published by Routledge in 2013. The primary questions the conference addressed was whether energy efficient buildings should look different from conventional buildings and whether that "look" can be used to explain or enhance their performance. Phrased another way, the question– as posed by editors of the forthcoming volume – is whether the purpose of energy efficient buildings should be simply to meet the standards of energy efficiency, or if they should also express energy efficiency in some way that might positively affect the health and well-being of the people who occupy it.

The conference, which was attended by 240 students, faculty, and professionals, was organized into three themes: Systems, Style, and Performance. A panel of four architecture and theory experts

presented on each theme.

Attendees represented five schools of design – Cornell University, Temple University, Philadelphia University, Drexel University, and the Rhode Island Institute of Technology – as well as countries as far away as England and Taiwan. The conference was also broadcast live to an audience of architecture students at Pennsylvania State University.



Architecture and Energy: Performance and Style book cover.

Source: *Penn Design*

The Problem With Style

Both theorists and practitioners often find discussions of style to lack the depth of more durable design considerations – for example, those that wrestle with construction, environment, and materials – that will outlast overt signatures of a specific style. Originally, style corresponded to historical eras but, during the modern age, style became a matter of choice. The freedom to choose a style of clothing, food, or architecture led research and marketing firms to begin “branding” and diffusing new products and technologies that can be “read,” or interpreted, as corresponding to a certain style. Style became an indication of taste rather than of historical location.

The structural and aesthetic elements of a building, which most individuals typically understand as style, influence how we perceive it; for example, a building's appearance might suggest that it is tied to a specific historical time period or architectural approach. Certain building designs communicate messages more explicitly than others: a building designed entirely of glass will make a stronger statement than a tract house. Likewise, architectural elements that indicate energy performance, such as green roofs or solar panels, will alert the casual viewer to performance efficiencies that otherwise cannot be seen. How individuals choose to interpret architectural energy performance signs, however, remains a complex cultural process, one that is sometimes used deceptively as "greenwash" to manipulate the symbolic elements of energy efficient design.

Despite the wariness with which the architecture and design community commonly approaches style, conference participants agreed that energy usage does affect building design, although the complex and sometimes problematic relationship between architecture and energy should not be oversimplified. Historically, periods of fuel scarcity – such as the late 1940s, the 1970s, and the later 2000s – have prompted architects and designers to focus explicitly on energy. However, the scale of energy's influence on architectural design remains under debate, as well as how exactly energy considerations factor into building design. Participants' opinions varied also on the value of using energy metrics as a tool for informing designs or regulating consumption.

Editors for the forthcoming book based on the conference discussion broadly classified the conversations on style into three approaches: (a) energy systems; (b) building performance; and (c) architectural aspects.

Energy Systems

According to conference participants, the amount of available energy – and, as a corollary, the amount of available wealth and power – serves as the primary determinant of the size, location, and ambitions of any architectural project. The supply of these resources is as much a function of the global economic market as it is of individual ambitions; therefore, assumptions about future fuel scarcity and increased environmental costs directly impact present-day design decisions. If an architect believes that, in the future, energy will be more expensive, more difficult to obtain, or both, these considerations will feed into her designs if she wants her work to remain viable into the future. However, market prices are not the only factor at play. Buildings are ultimately constructed with

an end user in mind. The anticipated energy consumption of the future inhabitants also strongly influences building design, and in addition to considering for whom they are designing, architects and engineers must also consider how these occupants will make use of the building, whether it be for retail, hospitality, or offices.

Building Performance

At the building performance scale, participants focused on unpacking the practical implications of the question that initially prompted the conference: should efficient buildings have a specific look? Though different kinds of energy performance enhancement measures will have different effects, many energy efficiency technologies have virtually no stylistic outcomes, which because of the "invisible" nature of the results can discourage investment or skew investment towards more visually demonstrative projects.

As the editors of *Architecture and Energy: Style, Performance, and Design* note, the desire for "symbolic" representations of an investment is perhaps one of the reasons that visually distinctive technologies like photovoltaics and windmills are often selected over more discreet technologies like furnaces or air handlers. However, this impulse suggests the limitations of style, discussed above and described in the forthcoming volume, in which "the exaggerated display of trivial features is the basis of fads" [1]. The result is either (1) the selection of more explicit, but perhaps less efficient, forms of technology; or (2) the alteration of designs to bring less-visible systems, such as heating and cooling systems, into the open.

As a contrast to design selections based primarily on symbolic energy efficiency measures, participants pointed to a bioclimatic, or passive, design approach to building construction. Bioclimatic designs strive to maximize the environmental effects of the "structural" components of buildings and minimize and/or eliminate "power-consuming" components. Bioclimatic designs focus on strategies such as building orientation, daylighting, and natural ventilation, obviating the need for extensive energy-intensive heating, cooling, and lighting components. The design of these types of buildings emphasizes the specific geographic and climatic context of each structure. These buildings tend to be planned smaller and thinner due to the importance of daylighting in these designs, along with other notable features that capitalize on geographically specific elements. As a result of necessity and not of choice per se, they have powerfully recognizable visual results. As noted by editors of *Architecture*

and Energy: Style, Performance, and Design, "connecting habitable spaces directly with the exterior environment also produces buildings that people prefer, making them easier to explain and advocate."

Architectural Aspects

The third approach builds upon the first two but focuses directly on architecture itself. In this approach, the complex relationship between architecture, energy, engineering, and the metrics of energy is re-emphasized. Ultimately, the connections between style, performance, and design cannot be reduced to a right "look" or style, or to claims of energy efficiency based on standardized metrics. Buildings constructed prior to the introduction of energy metrics, such as temperature and atmospheric pressure, remain some of the finest representations of buildings designed to suit the climate, maximizing natural lighting and heating. In these earlier eras, adapting designs to the surrounding environment was a necessity and determined much about a building's style. Over time, with the introduction of new technologies, the consideration of environmental factors in design, including geography and climate, have moved away from the environmental determinism of earlier eras. Today, designers have the choice to incorporate environmental factors in their plans. According to many contributors to the conference and book, that choice should be a goal. Just as style remains in some sense tied to what is considered stylish today, so too are methods of understanding and translating energy efficiency to building construction wedded to the present, and to the contemporary signs of architectural energy efficiency. Both what is considered stylish and what is considered energy efficient will surely change over time.

After Style

Ultimately, the 2011 conference revealed the limits of style as a means of understanding environmental performance. Instead, it became clear that the discussion of energy and architecture is more appropriately fitted into a framework of climate and region, which "subsume narrow concerns about energy within broader social, cultural and economic arguments" [1].

Below the surface of the discourse on style and symbolic architectural design lie more fundamental concerns of climatic or regional identity, combining claims about energy and resource efficiency with specific local forms, materials, or patterns of settlement. Conference attendees and contributors to the forthcoming book found it fitting that the EEB Hub was formed as a regional entity, but they debate

the appropriate scale for analysis of energy and resource efficiency, with some focusing on individual buildings while others making the case for the city-state or region.

The team of Hub investigators is planning a follow-up conference on January 25, 2013, at the University of Pennsylvania's School of Design. This conference, and the resulting edited volume, will further explore these deeper questions, drawing equally from both academics and theorists as from the world of practitioners.

Information on the 2013 conference is available at www.architectureandenergy.com. Questions or comments should be directed to William W. Braham at brahamw@design.upenn.edu.

References

[1] Braham, W.W., & Willis, D. (Eds.). (Forthcoming 2013). *Architecture and Energy: Style, Performance, and Design*. London, UK: Routledge.

Further Reading

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