How Architects Do and Do Not Drive New Construction Decisions

Baseline of Pacific Northwest Architects' Energy-Efficient Design Practices

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Abstract

The paper discusses an in-depth study of the baseline energy efficiency design and business practices of architects working in the Pacific Northwest in 2003. The purpose of the study was to estimate the percentage of square footage affected by energy-efficient practices in new commercial construction. To accomplish this purpose, the study team conducted in-depth interviews lasting from 40-70 minutes with 174 individuals selected from the population of architects, in contrast to architecture firms, throughout the four-state region of the Pacific Northwest.

A key business practice that energy efficiency programs targeted at new commercial construction seek to influence is the early meeting between designer and client, when goals for energy efficiency can be established for the design team. The baseline study explored the various early points of contact and revealed that opportunities for influencing design do exist, but are not as concrete as program designers would wish. Given that design occurs in stages and with different teams driving different stages of the design, there are multiple points at which influence is necessary. In particular, it is important that programs target engineers as well as architects, as engineers are the most likely decision-makers for mechanical system design. Also revealed by the study were specific practices of architects working in four sub-markets in commercial design: offices, hospitals, grocery stores and schools.

Introduction

Architects have long been the primary target for energy efficiency efforts in commercial new construction.[1] The theory has been that if one could influence architects to design energy-efficient buildings, then more energy-efficient buildings would be built. To that end, commercial sector new construction programs typically target services or incentives to architects and anticipate that they will be the conduit for reaching building owners and other building professionals such as engineers and contractors.

It seems that there are a few key reasons for this perception—that architects are easier to reach than owners or other building professionals. One is that there is a traditional relationship between architects and owners in which the architect is the advisor and consultant to the owner on design decisions. In this traditional relationship, the architects often hire the engineering services, actively

[1] Some of the programs operated in the past 15 years using this approach include: Architecture + Energy funded by the Northwest Energy Efficiency Alliance and Bonneville Power Administration (BPA); Energy Edge funded by BPA; Savings By Design, funded by California utility customers and administered by Pacific Gas and Electric Company, San Diego Gas and Electric, Southern California Edison Company and the Southern California Gas Company; and the New Construction Program funded by the New York State Energy Research and Development Authority (NYSERDA).

participate in the selection of the contractor and oversee the construction for the owners. A second reason is that architects are organized; they have professional associations and accreditation processes.

Owners could be anyone, in any of many different business areas, using any of a variety of investment strategies. They could use the building themselves, or they could just be an investor looking for a return when they would sell the building in the near future.

These assumptions are implicit in the energy efficiency community's focus on architects. However, the Northwest Energy Efficiency Alliance (NW Alliance) has learned over the course of evaluating their efforts to work with architects that these assumptions do not necessarily lead to changes in how new commercial buildings are constructed. There is a growing trend in design-build efforts—architects persist in the role of advisor and consultant to owners in some situations, but architects themselves comment that they don't recommend things they don't perceive the owner wants. So assuming that providing training to architects will be sufficient to change construction practices has not in fact turned out to be enough to make a difference in market transformation (Peters & McRae 2001).

The NW Alliance's Commercial Sector Initiative (CSI) provides services to architects, but is also developing and offering services to owners, specifically a persuasive business case with examples of energy-efficient solutions expressly designed for each of four target markets: schools, hospitals and healthcare, grocery stores and commercial offices. The business case for each sector, as well as information on successful projects, is expected to stimulate owners to want to pursue more efficient building practices on their own.

Understanding architects' design and professional business practices is important to assess whether the design community has the capabilities to provide the services the CSI promulgates to owners. To this end, the NW Alliance conducted a baseline study of architects to provide a basis for evaluating its efforts to influence the new construction market through the CSI.

This paper discusses the study methodology, including sampling and questionnaire development, and presents some of the key findings pertaining to points of influence, current levels of practice and differences in practices among architects working within different target market sectors.

Methodology

The methodology included development of a sample and a survey instrument and analysis of the data.

Development of a Sample

In developing the sample, the evaluation team explicitly sought to model from the population of architects, not from architecture firms. In previous work for the NW Alliance, while evaluating the Architecture + Energy (A+E) program and the Efficient Building Practices Initiative (EBPI), we found that we were often directed to the "green" partner when we did not have a name for specific architects within a firm (Dethman, Peters & McRae 2001a). Because the CSI targets up-and-coming architects, as well as those already leading a design practice, it was very important that the sample reach broadly into the architecture population. Thus, it would not be sufficient to focus on the partners or lead designers for a firm, though their names might be easier to obtain, as that would miss the up-and-coming architects.

To identify the population of architects located in the Pacific Northwest, the NW Alliance contracted with Energy Market Innovations (EMI) to develop a sample list. EMI first attempted to purchase lists of registered architects, either from the American Institute of Architects (AIA) or from state agencies in the region. EMI found that the AIA was not releasing their membership list for research purposes. Moreover, such a list would be limited to AIA members and not all architects belong to the organization. Typically, a limited number of a firm's architects are AIA members, suggesting that the AIA list alone, even if available, would be insufficient. Regarding information available from state agencies, it neither distinguishes between architects who specialize in commercial versus residential construction, nor does it provide telephone contact information. EMI and the NW Alliance therefore decided to compile a list using a combination of in-house and purchased resources.

A three-step process was undertaken to develop the list specifically for this project. The first step was to identify the leading firms in the region. Based upon an earlier analysis conducted for the NW Alliance, EMI had identified 110 top architecture firms in the Northwest. This list was compiled from regional "Book of Lists" publications for Seattle and Spokane, Washington, Portland, Oregon, and Boise, Idaho: the *2002 Puget Sound Business Journal Book of Lists,* the *Spokane Journal of Business Book of Lists 2002,* the *Portland Business Journal Book of Lists 2002 and* the *Idaho Business Review Top List 2002.* Using these lists, EMI selected the top ten organizations in each of the Seattle and Portland markets and the top five in Boise and Spokane, for a total of 30 firms. To this list, EMI added the affiliate offices that any of these companies had within the region, bringing the total to 34 firms.

Step two was the development of lists of key staff at these leading firms. EMI compiled a list of 495 architects practicing within the organizations. A variety of sources was used to identify these individuals including:

- The Seattle Lighting Design Lab database;
- An earlier AIA list used for an evaluation of the NW Alliance's Architecture + Energy program;
- NW Alliance-supplied lists of Architecture + Energy program participants; and
- Websites for the firms.

The third and final step was to overlay these data with purchased lists of architects. A comprehensive listing was purchased from Reed Construction Data (Reed). The primary benefit of the Reed list is that it may be easily replicated. These data, purchased in a proprietary database format, were then entered into an electronic data set that could be used in the sample.

The Reed list contained information on approximately 120 architects in the region who work on commercial projects. However, in a comparison of the Reed list with the list of individuals at the top firms identified earlier, EMI found the Reed list identified 251 individuals at the top 34 firms, whereas earlier efforts had identified 451 individuals at these same organizations. Of these, only 84 individuals appeared on both lists. In one case, the Reed list for one of the largest firms in Seattle (with nearly 300 professional employees) had only two individuals, the CEO and the president. Conversely, the largest firm in Seattle was listed with 43 individuals, nine of whom were also included on the compiled list. Therefore, in order to ensure that the population had adequate coverage of *individuals* among the most active firms, EMI merged the two data sets for these top 34 companies, resulting in a list of 621 unique names at these firms.

For the remaining firms below the top 34, the data were drawn entirely from the Reed list. The resulting data set, which consisted of 1,666 individual architects, is both replicable and comprehensive. Despite this effort, it was obvious that there could still be architects that were not included on the compiled list; and in fact, during the course of implementation, some additional firms were identified and then added to the compiled list for sampling.

Development of an Instrument

Research Into Action, Inc. worked with the NW Alliance to develop a data collection instrument. We began by conducting interviews with NW Alliance staff involved with the BetterBricks program, part of which comprises NW Alliance efforts to reach architects. These discussions identified a set of program assumptions and associated research inquiries that pertain to architects. These were compiled in a memo as the research questions and were approved by NW Alliance staff prior to the designing of the survey questions.

Next, we developed a set of screening questions to ensure that sampled architects provided architectural design for commercial construction in at least one of the four states in the NW Alliance service area in 2003. The screening questions also ensured that sampled architects do at least 50% of their work in commercial construction projects and that they work mostly in new construction or major remodeling projects.

The survey questions were designed both to inform the NW Alliance about the market and to provide baseline measures of current practices regarding program-targeted energy efficiency measures. Our goal was to inquire about various aspects of the typical architectural design process and to explore architect's attitudes about issues related to energy efficiency, as well as their awareness of specific energy-efficient technologies and practices. This is a common approach, yet there are two specific features to the questions that are uncommon in studies of design practice.

First, we asked the designers to estimate the total square footage of projects they had worked on in 2003. In subsequent questions, we further asked them to estimate the square footage in 2003 on which they applied each practice we were examining. This would enable us to calculate the percent of square footage to which each of the practices was applied by these architects. We chose to ask about square footage, fully aware that only about one-third to one-half of the architects would feel confident answering about revenue, square footage, or the number of projects that they had worked on. Of these elements, we chose square footage because it is the most meaningful to energy planers, not because it is certain to be known. It is also important to remember that our goal was not to estimate square footage for the region, since such an estimate would risk double-counting, but to be able to calculate a percentage.

The second feature, concerns the practice questions themselves. The questions about practices followed the approach outlined in McRae & Peters (2002) in which we disaggregate energy efficiency practices to specific components and then ask about each of the disaggregated components. Additionally, we sometimes lead with a general question about the practice, permitting the designer to give a positive answer to the general question and then, when the practice is disaggregated, respond that they do not do that component. This approach provides greater confidence that a designer actually understands what practice is being examined and can answer to that practice. This approach also avoids the possible situation where a question asks about "energy efficiency" generally and a designer, assuming their practices are energy-efficient, assents, leading to an analysis that draws conclusions assuming a higher level of energy-efficient practices than is actual.

Table 1 shows an example of the practices we queried architects about regarding daylighting design. First, we asked if they included daylighting in their designs; if so, we asked about the four different features that might be included in a daylighting design and asked architects to estimate the percent of square footage they had designed in 2003 that included this feature. The responses suggest that the percentage of floor space with one or two daylighting features is greater than that with four features.

Table 1. Percent of Sampled Floor Space Including Daylighting Design Features

Daylighting Design Feature	Percent Of Sampled Floor Space (sample=88,656,968 sq. ft.)
Design Configurations (building orientation on site, location of windows, floor-to-ceiling height, floor plate configuration)	55%
Shading Strategies (deeply shading overhangs, interior light shelves)	48%
Roof Configurations (clerestories, skylights, roof monitors, stepped roofs, saw-toothed roofs)	36%
Physical or Software Modeling	27%

We used *SPSS Data Entry Builder*, a computer-assisted telephone interview tool, to administer the survey and completed in-depth interviews with 174 architects. The interviews lasted from 40-70 minutes and were conducted by experienced executive interviewers.

Data Analysis

The analysis methodology largely involved counts, frequencies and cross-tabulations with X^2 statistical tests. The overall goal was to understand the percentage of square footage being affected by certain energy-efficient practices. Calculating the square footage to which practices were applied took considerable time and effort.

Each architect was asked to estimate the total square footage they worked on in 2003. For each practice they indicated that they had implemented, they were asked to indicate the percent of the total floor space they designed in 2003 that included that practice. Multiplying the percentage of the 2003-designed floor space for which each architect claimed to have included as a practice by the total floor space the architect reported designing in 2003, gives a rough estimate of the amount of floor space (in square feet) designed by each architect where he or she claimed to have included that practice. We then could sum these numbers for all architects and divide that number by the sum of the total floor space designed by all sampled architects to provide an estimate of the percentage of total floor space designed in 2003 for which architects claimed to have included the practice.

For instance, for daylighting, architects were asked to estimate the percent of the total floor space they designed in 2003 that included a daylighting strategy. Multiplying the percentage of the 2003-designed floor space for which each architect claimed to have included a daylighting strategy by the total floor space the architect reported designing in 2003, gives a rough estimate of the amount of floor space (in square feet) designed by each architect where he or she claimed to have included a daylighting strategy. Summing these numbers for all architects (50,931,782 sq ft) and then dividing that number by the sum of the total floor space designed by all sampled architects (88,586,968 sq ft) provides an estimate of the percentage of total floor space designed in 2003 for which architects claimed to have included a daylighting strategy: 57%.

This approach was applied to every practice and, in some cases, to practices within specific target markets. To accomplish this, we had to insist that the architect provide some estimate of square footage, even though some were reluctant to do so.

Findings

Architects in the Pacific Northwest report being interested in sustainability and energy efficiency. Yet most report that they have had less opportunity to work on such projects, both because owners do not make energy efficiency a priority and because sustainability and energy efficiency are lower priorities for their firms than for them as individuals. As an example, we found that while 97% of the architects had heard of LEED certification, only 12% were LEED-accredited and just 15% reported having worked on a LEED-certified project.

The BetterBricks.com website has made substantial inroads into the architecture community, with 74% of Northwest architects familiar with BetterBricks. Half of the architects (51%) have visited BetterBricks.com and one-third (34%) have visited that website more than once. This is a marked improvement over the 2001 findings for the Efficient Buildings Practices Initiative (Dethman, Peters & McRae 2001b) that showed that only 10% of the architects were aware of, and only 8% had visited, BetterBricks.com.

Integrated design is a concept that has different meanings to architects and energy efficiency program planners. For architects it can just mean including a variety of experts on a project; for efficiency program planners, it tends to mean including all members of the design and construction team in discussions about the project and energy efficiency solutions. The baseline suggests that there are opportunities for stimulating integrated design, as most architects report participating in team meetings throughout the course of a project. However, as can be seen in **Table 2**, these team meetings occur less frequently at the programming stage, the conceptual design stage, and the bidding and bid review stage—three stages where energy efficiency options, if not championed, can be easily dismissed.

Table 2. Participation in Project Design and Construction Team Meetings (multiple responses allowed)

Project Phase	**Percent of Sample (n=165)**
Programming	64%
Conceptual Design	76%
Schematic Design	89%
Design Development	87%
Construction Drawings	82%
Bidding and Bid Review	45%
Construction	70%
Occupancy	33%

Architects are more likely to be involved in specifying lighting than HVAC equipment. Electrical engineers, however, actively participate in much of the lighting design and nearly always are responsible for the development of lighting control strategies. Mechanical engineers are the ones responsible for HVAC design, with only a few architects reporting that they have a role.

Thus, it was not surprising that only one barrier to energy-efficient design of the eleven that we asked about was reported as important by more than 51% of the architects: a perceived difficulty in achieving occupant comfort with energy-efficient HVAC systems. Sixty percent of the architects reported this was an important barrier to doing energy-efficient HVAC design.

Daylighting has become familiar to most architects and we found that 45% reported using the four design approaches and tools we asked about in at least one project a year, although software and physical modeling are least used (See Table 1). Further, as shown in Table 3, architects working in schools are more likely to include all four daylighting practices in their designs.

Table 3. Percentage Use of All Four Daylighting Practices by Architect Type

Architect Type	**Percent Of Architect Type**
Schools (n=25)	56%
General (n=96)	48%
Office Buildings (n=19)	32%
Hospitals (n=29)	28%
Grocery Stores (n=5)	20%

While architects report that early design discussions for lighting frequently address daylighting, early design discussions for mechanical systems rarely do, as can be seen in **Table 4**.

Table 4. Topics in Early Schematic HVAC Discussions, by Architect Type

Architect Type	**Early Schematic HVAC Discussions Often (“4” or “5” on a 5-Point Scale) Include:**	
	Energy Efficiency	**Daylighting**
General (n=88, 86)	69%	35%
Office Buildings (n=18)	83%	33%
Schools (n=25, 23)	92%	61%
Hospitals (n=29)	55%	28%
Grocery Stores (n=4, 5)	75%	20%
Total (n=164, 161)	72%	36%

Passive heating, cooling and ventilation systems are much less commonly used than other energy-efficient solutions. Commissioning was conducted for 36% of the square footage designed by these architects in 2003 and was used by most on some of their projects. These results can be seen in

Table 5, which displays the results for questions asked of all architects regarding their commissioning practices.

Looking specifically at the four target markets, as noted above, schools appear to lead in daylighting and in energy efficiency discussions during the early schematic design stage. Schools also lead in the use of commissioning, with 47% of floor space commissioned in 2003 (see **Table 5**).

Table 5. Percent of Commissioned Floor Space by Architect Type

Architect Type	**Percent of Floor Space**	
	…of Architects of This Type	**…of Architects of This Type Who Had Any Space Commissioned**
Commissioned		
General (sample=53,672,470 sq. ft.)	41%	51%
Office Buildings (sample=10,366,210 sq. ft.)	31%	44%
Schools (sample=8,013,288 sq. ft.)	47%	57%
Hospitals (sample=9,355,000 sq. ft.)	20%	36%
Grocery Stores (sample=7,250,000 sq. ft.)	18%	87%
All (sample=88,656,968 sq. ft.)	36%	50%
Commissioned by Third-Party Agent		
General (sample=53,672,470 sq. ft.)	29%	36%
Office Buildings (sample=10,366,210 sq. ft.)	25%	36%
Schools (sample=8,013,288 sq. ft.)	33%	40%
Hospitals (sample=9,355,000 sq. ft.)	16%	29%
Grocery Stores (sample=7,250,000 sq. ft.)	18%	87%
All (sample=88,656,968 sq. ft.)	27%	37%

Hospital architects are more involved in lighting specifications than those in any other sector except for grocery stores, yet they are the least involved in HVAC discussions. Hospital architects report the lowest rates of building commissioning, at 20% of the 2003 floor space.

Grocery store architects were the least common specialty group in the population of architects we sampled from and report the least interest in energy efficiency by their clients, while at the same time, they report the highest rate of including energy efficiency goals or performance benchmarks in their projects. They are the most involved of all architect groups in specifying lighting and include daylighting the least.

Architects who specialize in office buildings report the highest amount of floor space for which they claim to have included a daylighting strategy in 2003. They also report having more discussions about energy efficiency in early schematic discussions of lighting, yet they also report specifying lighting for the smallest amount of floor space.

Conclusions

Revisiting the assumptions that lead energy efficiency program designers to target architects, there are some key lessons in this baseline regarding the first assumption—that architects drive the design process. First, as the NW Alliance discovered in previous work, architects have to be responsive to their client. The architect and client establish a "program" for a project. If the client (the owner) does not establish energy efficiency as a component of the program, it is highly unlikely that an architect will bring it up, even if the architect is knowledgeable and facile with energy efficiency practices.

Second, architects clearly do not feel that they have the last say in what is installed in buildings. They would like to, but they often do not. However, there is no one who consistently does have the last say. Owners, architects, engineers, specifiers, contractors and equipment distributors and dealers all have a role to play in determining what finally is installed in a building.

Third, though the design program is important to setting the stage for the project, it generally is not enough. Decisions are made throughout the design process and energy efficiency can always be relegated to the cutting floor if there is no one knowledgeable enough to offer an energy-efficient solution when tradeoffs are made. Alternatively, it could be elevated as a solution if there is someone knowledgeable on the team. Architects are important in lighting decisions, but engineers are the most important in HVAC decisions. In an actual building project, lighting is often put in just prior to occupancy when the tenant is known, because lighting choice is very dependent upon tenant needs. Mechanical systems typically will be installed before occupancy during building construction.

Thus, this baseline suggests that a multi-faceted effort including, but not limited to, architects is important in ensuring energy-efficient decisions are made in new construction projects. Engineers, architects, owners, tenants and contractors will each make decisions that influence the final design and choice of equipment. While there are meetings at which all parties are present, ignoring any of these actors in a program design leaves open the possibility that energy-efficient solutions will not be implemented.

The other driver for targeting architects seems to be a mixed blessing. Yes, architects are organized, but not all architects are members of AIA, nor are all licensed architects active in the commercial sector. Engineers are less easily targeted than architects, as there are a variety of engineering associations and types of licenses that can be important for building projects. It is therefore difficult to be certain that program marketing efforts will reach the people that are making the design decisions. Similarly, unless there is outreach to contractors, owners and tenants, there will be decisions made without the knowledge of the efficiency tradeoff.

The message from the baseline is that architects are improving their practices and knowledge; outreach, training and education for architects do work—but they are not enough. There are too many others involved in decisions to support the theory that reaching architects is sufficient. Architects do not solely drive the design and construction of new commercial buildings. Engineers, lighting designers, specifiers, owners, tenants, contractors and distributors are all important in the decision-making process. They can inadvertently thwart an efficient project by offering a less expensive alternative or a different aesthetic without knowing that the effect on energy efficiency will be important.

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