BetterBricks Design and Construction Initiative

Market Progress Evaluation Report #2

PREPARED BY

PWP, Inc.

REPORT #E08-189
APRIL, 2008

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FINAL

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Executive Summary

In 2007, the BetterBricks Design and Construction (D&C) initiative made significant advances in promoting changes in practice that lead to low-energy, integrated design solutions. The network of five integrated design labs (IDLs) and the BetterBricks Business Advisor assisted architecture firms throughout the region on dozens of projects in the target markets, began promoting a uniform description of the concept of integrated design (ID), and expanded the number of firm focus (FF) firms to five with the addition of two of the largest architecture firms in the region as FF partners in the late summer and fall of 2007[1].

BetterBricks D&C efforts were reinforced by the growing interest in sustainable design triggered by awareness of global warming and the resulting initiatives by AIA, the USGBC and others to encourage design of high performance buildings. The 2030 Challenge, as well as a number of advances in LEED, ASHRAE and other state and local initiatives, have called attention to the need for new design approaches to support sustainability and energy efficiency. This creates an opportunity for BetterBricks to align its objectives with the widely publicized goals for these other initiatives.

The FF approach – where BetterBricks establishes strong relationships with a few architecture firms in the target markets – has begun to lead to changes in the design and marketing techniques used by FF partner firms. FF firms are using the services of the BetterBricks Business Advisor and the IDLs to advance their ability to design efficient buildings and to incorporate their commitment to high performance buildings in marketing and strategic planning.

- Five firms are committed to or practicing energy-focused integrated design, representing over 50% of the healthcare market and over 40% of the office real estate market in the Pacific Northwest.

- Two of the first three FF firms have embraced both the input of the Business Advisor and the design assistance of the IDLs; a third one has rejected strategic input from the Business Advisor but is still working with an IDL on actively pursuing ID on a number of projects and has committed to the 2030 Challenge.

- Two new FF firms are excited about the prospect of working with the IDLs and have been receptive to early input from the Business Advisor.

The IDLs initially without FF relationships have also made progress in the promotion of ID:

- For Montana, a FF relationship with the largest design firm east of the Cascades ensures a full workload for design assistance over the next several years, helps BB provide services to the Eastern part of the region and addresses all of the BB target markets.

- In Spokane, the focus continues to be on building relationships with architecture firms and seeking out projects, with most contacts resulting in “planting seeds” so that owners

[1] Throughout this report, Firm Focus firms are identified as Firm A, Firm B etc. to maintain confidentiality.

or architects will come to the lab for assistance in the earlier stages of future projects.

- The Boise lab enjoys strong interest from the design community, working with an average of 30-40 projects a year and having to turn projects away and miss opportunities to influence some key projects because there is not enough time to pursue them.

MARKET STATUS

A survey of 97 commercial architects completed in the summer and fall of 2007 found that architects are aware of and interested in energy efficiency, as indicated by their high level of awareness of integrated design techniques, interest in sustainable design, targeting efficiency levels 10% above their current state or local code on more than 30% of projects, use of sustainable design in marketing and participation in whole-team meetings early in the design process on a significant percentage of projects. On the other hand, use of many advanced design techniques falls far short of the level of awareness, energy efficient design are overruled on up to 26% of projects, and architects generally do not feel they have full opportunities to work on sustainable design projects. Equipment costs, design cost and owner indifference limit the ability of architects to implement energy efficient design, although client interest has grown. LEED continues to be a focus of sustainable design efforts, with almost one-third of respondents LEED-accredited, and more than 60% of architects reporting that they worked on at least one LEED building in 2006-07.

CONCLUSIONS AND RECOMMENDATIONS

The unprecedented interest in carbon reduction, green building, and sustainable design comes at a time when much of the infrastructure for promoting ID through the Design and Construction initiative is in place. BetterBricks should look for opportunities to take advantage of this interest, including the following:

- More closely align BetterBricks goals with the highly visible market trends discussed above. Expressing Design and Construction targets in terms of greenhouse gas reductions or percentage of progress towards zero net energy as well as energy savings can help the target market see the link between BetterBricks and these broad, well known goals.

- Consider providing technical assistance specifically for the mechanics of tracking progress toward the 2030 Challenge and interim goals such as the 50% reduction in fossil-fuel GHG-emitting consumption 2010.

- Take advantage of commitments -- to the 2010 goals, the 2030 challenge, LEED certification or accreditation, or other well defined goals -- by providing visibility and publicity to design firms, owners, developers, government agencies and other organizations who make such a commitment, both within and outside the D&C target markets. This would reward that commitment and help ensure that those firms and organizations continue to pursue it. Similarly, the role of the IDLs in helping firms achieve those goals should be publicized in the academic and professional communities.

While design assistance on firm focus projects is providing staff development through hands-on education for the designers directly involved, there have been few internal training sessions to help disseminate knowledge of ID techniques throughout the FF organization. With three of these firms almost through their second year as FF partners, it is a high priority for BetterBricks to begin training activities on both the technical and business aspects of ID within the FF firms.

The Eugene/Portland Energy Studies in Buildings Lab (ESBL), the Puget Sound lab in Seattle and the Boise lab are working at capacity and, with the addition of a new FF partner, it is likely that Bozeman will be too. The Spokane IDL, however, remains underutilized. Just as a FF relationship is creating a stream of projects for Bozeman, a similar arrangement might bring the Spokane lab nearer to its capacity. While there is no firm comparable to Firm E in Eastern Washington, there may be smaller but otherwise qualified architecture firms in the region that could benefit from a "FF-lite" relationship.

The Boise IDL has been very active in reaching out to the design community, developing case studies, organizing training presentations, and building ID capability locally. Even without a FF relationship, it should be possible for the Boise Lab to provide some assistance on the marketing and business aspects of ID through at least limited access to the services of the Business Advisor to support the development of business and marketing skills among local architects who have shown capability in the technical aspects of ID.

In part because of the time involved in getting the full BetterBricks Design and Construction initiative in place, it seems unlikely that any of the first three FF firms will be able to consistently pursue ID without outside assistance at the end of the initial three year contract. For each FF firm, a strategy should be developed to ensure a smooth transition out of the FF relationship so that gains can be maintained once support is taken away.

One of the assumptions behind the D&C Initiative is that methods and products to design energy efficient buildings will be available in the marketplace, and not just from the IDLs. So far, however, while there is some evidence of engineering firms enhancing their capabilities, the market is generally not offering the services provided by the labs. BetterBricks should conduct a systematic analysis of services available to support ID around the region in anticipation of some of the FF firms transitioning out of that relationship.

There is currently very little coordination between utilities and the AIA 2030 Challenge, and a number of utility representatives showed little understanding of the AIA initiative, with several believing it was concerned only with gas or coal. Providing additional information on the 2030 Challenge to the utilities should be a high priority for the region's ASHRAE and AIA chapters and BetterBricks, particularly if BB more closely aligns its Design and Construction objectives with those of the AIA initiatives.

While survey results show architects to be very aware of and interested in energy efficiency, use of many advanced design techniques falls far short of the level of awareness. BetterBricks should focus on showing the broader audience of designers how to implement more advanced techniques and on how to market ID to owners.

Despite having failed to incorporate ID into a strategic plan, Firm B is working with both the

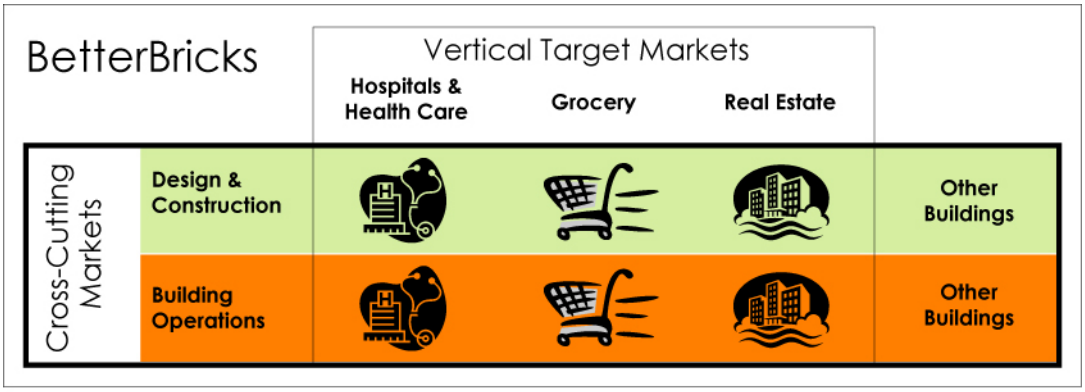
Portland and Seattle labs and has also utilized the BetterBricks marketing team to develop marketing materials, prepare case studies and pursue speaking engagements. The question is whether this is in keeping with the terms of the original FF agreement, and whether BB should continue to provide Firm B with access to the services of the ESBL and the Puget Sound IDL. In light of the size of the firm and the opportunity for BetterBricks to influence a major player, we believe the FF relationship should be maintained.

1. Introduction

The Northwest Energy Efficiency Alliance (NEEA) is a non-profit corporation supported by Bonneville Power Administration, electric utilities, public benefits administrators, state governments, public interest groups and energy efficiency industry representatives. These entities work together to make affordable, energy-efficient products and services available in the marketplace.

This second Market Progress Evaluation Report[2] presents the results of PWP Inc.'s (PWP's) evaluation of NEEA's BetterBricks Design and Construction Initiative activities between November 2006 and October 2007. Research in support of this report was conducted in August through October 2007.

BetterBricks comprises all NEEA commercial activities. BetterBricks currently addresses three 'vertical' markets (hospitals and health care, groceries, and commercial real estate), and two 'cross-cutting' markets (design and construction, and building operations). As shown in the figure below, vertical and cross-cutting markets overlap, representing the relationship between the demand (vertical) and supply (cross-cutting) sides of a given market.



The long-term goals of BetterBricks are to transform specific components of the commercial market and, specifically, to:

- Make energy efficiency an integral part of business decision-making. Within targeted vertical markets change energy related business practices to achieve energy efficiency in design and construction and in building and facility operations. Create natural market demand for products and services offered to the targeted market by its suppliers – also referred to as trade allies.

- Transform trade ally products and service offerings within the cross-cutting design and construction and building operations markets to deliver high performance (energy

[2] NEEA has run programs targeted to commercial new construction since its inception in 1997. This is described as MPER #2 because it is the second MPER in the current initiative that began January 1, 2006, which represents a substantial shift in the focus and strategy of past years.

efficient) buildings. Align trade ally business resources and build market capabilities to meet and increase market demand[3].

The changes in business practices will result in facilities that achieve reductions in energy-related capital and operating costs, as well as potential non-energy benefits, such as occupant comfort and productivity, and an alignment of design and construction projects with industry best practices. This evaluation does not address the vertical target market, owner-focused efforts, although BetterBricks activities in these markets clearly influence the demand for the trade ally services mentioned above and targeted by the Design and Construction Initiative.

INITIATIVE DESCRIPTION

The goal of the Design and Construction Initiative is to transform the commercial new construction market so that a set of design approaches and practices collectively known as Integrated Design (ID) becomes standard practice. The Design and Construction Initiative uses the following energy-focused definition which was created by the integrated design labs (IDLs) that provide technical support for the initiative:

> In the creation of the built environment, integrated design is the synthesis of climate, use, loads, and systems resulting in a comfortable and productive environment and a building that is more energy-efficient than current best practices[4].

The five potential benefits of ID are reduced operating expense; reduced construction cost; increased staff productivity, retention and morale; positive community image; and continuous improvement from project to project. A major emphasis in the initiative's ID process is to encourage its application early in the design process. The entire ID approach is premised on being able to make far-reaching decisions about all aspects of a building's design, including siting, occupancy, and morphology – all of which require fundamental design decisions during the programming or conceptual design stages. If such decisions have been made before the process begins, the impact of the ID approach will be limited.

The Initiative hopes to begin a market transformation to integrated design using a complex set of interrelated approaches, including technical assistance, education and training, marketing and, primarily, a strategy known as the Firm Focus (FF) approach – working with a few selected architecture firms to influence their business practices and increase their technical capabilities to deliver ID, particularly to the vertical markets targeted by BetterBricks. Firm focus relationships are formal in the sense that a memorandum of understanding (MOU) is signed by both parties. The MOUs state that, "The long-term goal of our working relationship is to design and build buildings that achieve energy performance of at least 25% better than current code." BetterBricks agrees to provide design assistance on mutually selected projects, supported by education,

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[3] Northwest Energy Efficiency Alliance. 2006. *Commercial Sector Initiative 2006-2008 Project Description (July 5, 2005).* Portland, OR.: Northwest Energy Efficiency Alliance.

[4] "Rethinking the Design Process". From a presentation prepared by the Energy Studies in Buildings Laboratory, University of Oregon and Konstrukt. May 18, 2006. The two paragraphs following this definition are also taken directly from or draw heavily on materials in this presentation.

training and research and business planning assistance, including strategic planning and marketing. BetterBricks also agrees to try to publicize successful projects to encourage greater awareness of the benefits associated with energy efficiency. The architectural firms agree to provide an opportunity for BetterBricks contractors to help prepare proposals, to collaborate on architectural design and business practices to incorporate energy efficiency, and to increase efforts, with BetterBricks support, to pursue projects in the vertical markets.

While BetterBricks is providing significant resources to the FF firms, the intent is not to provide a permanent source of assistance but rather to build the firms' capability to do ID work on their own. The assumption behind the D&C initiative is that as the FF firms gain visibility, build their reputation, and increase their market share of the target markets through their expertise in and commitment to ID, other architecture firms serving those markets will have to follow suit to remain competitive. Similarly, in-house design departments within the target markets are expected to see the success enjoyed by FF firms with their ID approach and adopt a similar approach for their own hospital, grocery store, or commercial real estate projects.

The initiative offers both technical and business assistance to FF firms and technical assistance to non-FF firms. Additionally, there are education and training opportunities offered to the broader design and construction market. The relative importance of various activities is illustrated by the budgets associated with the IDLs and other activities, shown in Table 1.

Table 1.: D&C Budget, by Function and Year

	2006	2007	2008
Integrated Design Labs (Total)	**$1,382,819**	**$1,959,704**	**$2,077,059**
Education and Training	$150,814	$172,657	$179,300
Product & Service Development	$284,474	$247,700	$228,573
Technical Advisory	$927,281	$1,504,347	$1,599,186
Codes and Standards	$20,250	$35,000	$70,000
Business Advisors	**$90,479**	**$275,000**	**$290,000**
Non-Integrated Design Lab Activities (Total)	**$542,348**	**$615,000**	**$605,000**
Product and Service Development	$153,598	$140,000	$160,000
Technical Advisory	$13,750	$100,000	$70,000
Marketing	$250,000	$250,000	$250,000
Education and Training	$125,000	$125,000	$125,000
Design and Construction Initiative Total	**$2,015,646**	**$2,849,704**	**$2,972,059**

Technical Assistance is provided by a network of five integrated design labs (IDLs) under contract to BetterBricks. The current IDLs evolved from two labs that pre-dated BetterBricks: the University of Washington Daylighting Lab, established more than a decade ago in Seattle, and the Energy Studies in Buildings Laboratory (ESBL) of the University of Oregon which had its original office in Eugene but has added a Portland location under the BetterBricks contract. These labs worked with architects, lighting designers, engineers and others on a project-by-project basis. The Puget Sound lab provided expertise in daylighting and more efficient use of electric lighting but did not address mechanical systems; ESBL was one of the country's early implementers of design projects that considered all energy-using systems in a building. The labs

are now funded specifically to provide comprehensive ID services including daylighting, lighting and mechanical systems[5]. The various types of expertise required may be provided by in-house staff or contractors.

In addition to broadening the scope of the existing Puget Sound and Portland/Eugene labs, BetterBricks also opened three new labs as part of the design and construction initiative. While the design labs in Seattle and Oregon had been providing design support to projects across the region, it was felt that a broader network of regional labs would bring this resource closer to markets outside Portland and Seattle. As a result, IDLs were established in Boise in 2004 and in Spokane and Bozeman in 2006.

The five IDLs operate independently but have a strong collaborative relationship. They hold regular conference calls to share information, assess progress and coordinate their activities. In addition, there are extensive informal ties and interactions between the labs. For example, the Director of the Boise lab formerly worked at the Seattle Daylighting Lab, and the Directors of the Portland/Eugene and Puget Sound labs have been collaborating on projects for decades. Key joint activities in 2006 were the development of the ID definition along with ideas on the appropriate way to present that definition. Methodologies to identify savings and estimate costs were also developed. Creation of an ID curriculum to be used to train architects is an on-going collaborative venture that has made substantial progress in 2007.

The Puget Sound and Portland/Eugene labs each serve as the primary contact for two Firm Focus relationships, while the Montana lab added one in 2007. In addition to providing direct assistance on individual projects, all of the labs use a "project-based education" approach for firm focus, where the IDL stages a one- or two-day workshop to interact with multiple design teams for individual projects, and by providing firm-wide training for ID. The labs are also involved in developing and delivering training and informational material for the broader market.

Business Assistance, available exclusively to Firm Focus firms, is provided through a contracted Business Advisor expert in the planning, positioning, and marketing of architecture firms. The Business Advisor helps FF firms to develop a statement of corporate commitment to energy efficiency and ID and shows them how to use ID as a tool to position and market the firm relative to its competition. In addition, the Business Advisor assists in the selection and recruitment of FF firms, using his knowledge of the architecture market both to identify appropriate firms and to make the case for participation to those firms.

The D&C Business Advisor is also intended to interact with Business Advisors to the vertical markets targeted by BetterBricks: hospital, grocery stores, and commercial real estate (although the D&C and real estate advisors have not yet worked together.) As these vertical markets are influenced to pursue more efficient designs for their new construction projects, the strategy for the FF firms to succeed in each market will also change.

The Business Advisor assists FF firms in marketing by providing advice related to target markets

[5] Ideally, all projects would include all energy-consuming systems in their design process. In practice, clients may choose not to address various systems for a variety of reasons. The Labs' job is to promote the ideal version of ID but to work with clients at whatever level they are ready for. Preference, though is given to projects which apply the ideal version.

as well as sales strategies for pursuing specific projects identified by the firms themselves. The Business Advisor also reviews existing business collateral materials and supports the revision or updating of such collateral; identifies potential organization conferences where speaking opportunities for FF personnel would advance their position in the sector. In addition, they draw on the capabilities of the BetterBricks marketing team, including outside PR firms, for preparation and placement of success stories in appropriate media, and advice related to collateral and speaking opportunities.

Education & Training (E&T). BetterBricks E&T offers public education and training sessions -- sometimes in partnership with the IDLs, and frequently in partnership with related market associations such as the Cascadia Chapter of the U.S. Green Building Council, the American Institute of Architects (AIA), and the American Society of Heating Refrigeration and Air Conditioning Engineers (ASHRAE). E&T is not directly involved with professional education at Firm Focus firms, but labs with Firm Focus relationships can use curriculum developed by E&T for those purposes.

Marketing. BetterBricks marketing for D&C operates on several levels: developing and maintaining the BetterBricks website, providing one-on-one assistance to FF firms in the areas of marketing collateral and public relations and organizing public events such as the BetterBricks awards. Marketing also provides limited assistance to the lab network for their collateral needs. Most important in terms of market transformation, marketing is responsible for the dissemination of success stories to the broader D&C market to raise awareness of integrated design and its benefits.

PROGRAM THEORY

The Design and Construction Initiative's market transformation theory is expressed in the hypotheses and long-term goals given in the project description approved by the NEEA Board in July 2005 and summarized in Table 2. The assumption inherent in the market transformation playing out as shown is that the necessary methods and products to design and construct energy efficient buildings will be available in the marketplace. While part of the short-term strategy of the BetterBricks initiative is to provide these methods and products through the services offered by the Integrated Design Labs, the longer-term goal is to have the market build the capability to provide all the needed support.

Table 2.: D&C Initiative Hypotheses and Long-Term Goals

HYPOTHESES	LONG-TERM GOALS
If owners (and their agents) are aware of the benefits of high performance buildings and how they align with their business interests, then they will demand high performance buildings.	Owners demand energy efficient (high performance) buildings, with A&E firms promoting their attributes and aligning their business resources accordingly.
If A&E firms are aware of the benefits of high performance buildings and how they relate to their clients' business interests, then they will promote high performance buildings to their clients. If architects and design engineers are encouraged by their firms and clients to apply integrated design and advanced design and construction practices, then they will do so to the extent of their abilities.	The building design and construction process embraces integrated design and the application of advanced design and construction practices.
If architects and design engineers gain further experience with integrated design and advanced design and construction practices, then capabilities will increase and these practices will become common practice.	Design and construction market capabilities result in buildings that minimize energy use as the norm.

Table 3 presents key components of the logic model that are relevant for the current MPER; that is, the activities, outputs and outcomes that are sought for the 2006-2010 timeframe.

Table 3. - BetterBricks Design & Construction Market Logic Model

Phase I Activities (2006-2010)	**Phase I Outputs**	**Phase I Outcomes—Short Term**
In order to address the situation we will conduct the following activities	*We expect that if completed or underway these activities will produce the following evidence:*	*We expect that if completed or ongoing these activities will lead to the following changes by 2010*
Phase 1 begins with strategic and tactical planning and develops key products and tools for the strategies and tactics. Targeted and focused implementation occurs. Specific activities include: ***Develop products*** *(tools and guidelines):* - Value proposition to guide the D&C effort. - A&E business support materials for the business advisors (e.g. Letter of Agreement and Activity Plan) - Useful guidelines, protocols, tools and information on integrated design for A&E practitioners (e.g. definition of integrated design process and methods). - Limited guidance for owner-side decision makers on design and construction best practices in support of TM efforts. - Support development of national standards ***Provide direct assistance*** *to design firms:* o A&E Firm Focus: Work in-depth with select A&E firms to evolve their business models and service offerings. o Technical Advisory Resources: Provide project specific technical assistance on integrated design with primary focus on target market projects. ***Develop and offer education & training****:* - Professional development opportunities for architects and designers conducted in partnership with AIA, ASHRAE, Cascadia GBC, utilities/public benefits administrators, professional training organizations and others. ***Build market awareness via Marketing strategies*** - Build awareness and support for integrated energy design and high performance buildings with A&E firms, owners and developers using: - Collateral materials - Public relations and events - Articles and case studies - Electronic media (Website and email) - Limited advertising.	***Products:*** associated tools, materials and resources include: - Letter of Agreement for firms - Firm-Focus A*ctivity Plan* - Definition of integrated design and detail on process and methods - Guides for owners (Hospital, Office) - Generic ID Guide for Designers - Technology or Design strategy-specific information (e.g. Perimeter Beam Study, Hospital Patient Room Study, Prototype Classrooms, etc.) - Guidance on modeling tools (BIM, energy modeling). - Support Advanced Buildings (Core Performance) - Limited new or revised national standards. ***Education & training materials and engagements:*** - Curriculum on integrated design process and methods with modules for each target market. - Delivery of classes, workshops and brownbags: a) through partner organizations, b) direct to firm-focus firms c) direct to market actors. - Participation in regional conferences ***Marketing content and activities****:* - Case studies - Web content/ Website section - Collateral such as briefs, flyers, fact sheets, posters and handouts for events. - Sponsorship and organizing events with partner organizations - articles in trade publications. ***Assistance to Design Firms:*** - Specific firms targeted for firm focus - Activity Plans developed and being implemented at selected firms: - business planning - technical assistance - professional development (E&T) - product & service development - A few comprehensive integrated design projects	Market partners, including utilities, trade associations and select firms help support and promote integrated design. 60% of NW A&E firm decision makers are aware of the business opportunity and client benefits of high performance buildings. A&E firms representing a significant percentage of the design and construction market adjust their business practices to deliver high performance buildings. • A&E firms representing 25% of healthcare market share. • A&E firms and in-house designers representing 17% of targeted grocery market share. • A&E firms representing 15% of targeted real estate market share. A significant percentage of the floor area of new project designs are incorporating partial and full integrated energy design strategies that rely on passive or low-energy solutions for lighting, ventilation, comfort and critical process loads resulting in savings greater than 25% over baseline: o 25% of hospitals and healthcare projects. o 17% of targeted groceries. o 15% of targeted real estate. o 5% of projects within other vertical markets.

In addition to the outcomes shown in Table 3, there are other indicators that have been developed by the evaluation team to assess the progress BetterBricks is making toward its goals. These indicators include:

- Percentage of Architecture firm principals who can
  - define integrated design (as defined by the D&C initiative) and describe specific benefits to their clients
  - describe the specific benefits of integrated design to their business
- Percentage of architectural firms using ID in their marketing materials and/or on their website
- Percentage of proposals from architectural firms submitted that describe and promote ID
- Percentage of mechanical design engineer firm principals who can define integrated design and describe specific benefits to their clients
- Percentage of projects
  - with design documents offering integrated design as "base case" rather than an extra cost alternative
  - for which design engineers are involved during programming, conceptual design, schematic development, design development
  - with energy design charrettes.
  - designed to use at least 25% less energy than code
  - on which energy modeling is done 1) overall 2) during pre-design or early design (i.e., through schematics)
  - using specific ID strategies (e.g., downsized HVAC through daylighting, natural ventilation; evaporative cooling; night ventilation of mass; DDC for HVAC; task lighting; roof configurations for daylighting, etc.)

PREVIOUS MPER FINDINGS AND RESPONSE

Conclusions and recommendations from the first MPER focused on the need to better define the integrated design (ID) approach, the need for the Integrated Design Labs (IDLs) to balance their Firm Focus (FF) commitment with their other relationships and the desirability of working closely with other organizations that share BetterBricks' (BB's) goals. Specific recommendations included:

- Develop a clear definition of the concept of ID being promoted by BB and consistent terminology to describe this concept in BB marketing efforts.

- Establish advisory committees for the Spokane and Bozeman IDLs

- Add one or more large FF firms once the Oregon and Seattle labs have fully established their the initial FF relationships.

- Improve communication between the design and marketing functions within the individual FF firms, as well as among the Business Advisor, IDLs and BB Marketing functions.

- Review annual activity indicators and long-term objectives to ensure they are achievable within the required timeframes.

- Integrate engineers more fully into BB efforts to promote integrated design

- Continue to encourage owners to demand high performance buildings, including some of those built using design-build contracts

- Develop a consistent strategy for working with LEED, AIA and other organizations to maximize their emphasis on energy efficiency.

As discussed throughout this MPER, BB has taken a number of actions that address these recommendations.

- ID has been more clearly defined and is being consistently promoted in BB marketing, education and training.

- All of the IDLs are working closely with the design communities they serve for assistance in identifying potential partners and projects.

- Two large architecture firms have been added as FF partners, including one of the largest firms in the region and the largest firm east of the Cascades.

- The Business Advisor has been tasked with expanding the marketing capabilities of each FF firm to communicate the value of ID and high performance buildings and with training design staff on how to sell ID to clients.

- Annual indicators, long-term objectives and the logic model continue to be refined

- IDLs are encouraging early involvement of engineers in all FF projects and have built or retained engineering capability to support ID efforts on projects

- Target market specialists continue to encourage owners to demand high performance buildings, but no specific strategies for design-build projects have been developed

- In part because of BB interaction with LEED projects and LEED standard setting, LEED now requires 2 energy points. Key market barriers and opportunities (including working with the US Green Building Council, AIA, and others) have been incorporated into the updated logic model.

2. Evaluation Methodology

This MPER #2 is the second of three planned for the Design and Construction initiative. Evaluation research for this MPER focused on documenting the activities of the integrated design labs and firm focus firms and conducting a survey of architects in the regions.

An overview of activities planned for the entire 2006-2008 evaluation period is presented in Table 4.

Table 4. – Design and Construction Evaluation Overview

COMPONENT	MPER #1 MAR '07	MPER #2 JAN '08	MPER #3 Q109
Market Characterization	X	X	X
Assess Logic Model	X	X	X
Assess Market Progress		X	X
Assess Progress Towards Goals	X	X	X
ACE Model Review			X

Table 5 shows the specific activities that will be conducted and the data sources that have been or will be used for each MPER.

Table 5. – Design and Construction Evaluation Overview

Task	Data Sources	MPER #1 Mar 2007	MPER #2 Mar 2008	MPER # 3 Q109
Review Program Approach, Theory	Program Documents	x	x	x
	BetterBricks staff	x	x	x
Document Initiative Activities				
Firm Focus firms	A&E firm staff	x	x	x
Technical Resources	IDL Directors	x	x	x
Business Advisors	Business Advisor	x	x	x
Education and Training	BetterBricks staff	x	x	x
Marketing	BetterBricks contractors	x	x	x
Market Assessment				
Market Characterization	Literature review	x	x	x
Market Progress				
Firm Focus Firms	A&E firm staff	x	x	x
	A&E firm documents	x	x	x
	IDL staff	x	x	x
	Business Advisors	x	x	x
Architects	Architect Survey		x	
Engineers	Engineer Survey	x		x
ACE Model Review	Program documents		x	x

The evaluation was conducted through analysis of data collected through a combination of secondary data and program document review; on-site and telephone interviews with BetterBricks staff, contractors, and Firm Focus partners; and surveys of commercial architects. Each of these data sources is discussed below.

DOCUMENT REVIEW AND SECONDARY DATA

Program descriptions, letters of agreement, progress reports, and other program documents were reviewed and analyzed, first to state and illustrate the program theory, and second to provide a basis for comparing these documents against expectations and experience to date. Secondary data also helped provide a picture of the industry structure to support an overview of the market, including a comparison to national trends or developments. Specifically, the market characterization was drawn largely from secondary sources, including U.S. Census Bureau statistics, trade associations, and regional and national industry publications and websites.

PRIMARY DATA

Primary data were collected directly from the Integrated Design Labs, the Design and Construction Business Advisors, other contractors and program staff, FF participants, and other market actors. The number of interviews completed is presented in Table 6. Architects were surveyed to update information collected in a 2004 baseline assessment of their involvement in the design process and their knowledge and use of efficient design techniques.

Table 6. – Completed Interviews

BetterBricks Staff	4
Integrated Design Labs	5
Business Advisors	2
Other Contractors	3
Firm Focus Architecture Firm Staff	12
Architects	97

3. Market Characterization

Market Size and Distribution

As discussed in the previous MPER, the $3 million average annual budget of the Better Bricks D&C initiative over the 2006-2008 funding cycle is just a small fraction of the $10 billion annual new construction market in Pacific Northwest, as reported by the 2002 Economic Census, which has the most recent detailed data available. Table 7 presents both the distribution of the value of construction across the four states and across several of the most prominent market segments.

Table 7.: Value of New Construction – 2002 Economic Census (in millions of dollars)

	% of PNW	PNW	Wash.	Oregon	Idaho	Montana
TOTAL NEW CONSTRUCTION	100.0%	**9,804.7**	**5,450.9**	**2,753.0**	**1,069.3**	**531.5**
Lodging	4.6%	455.1	241.8	152.9	28.3	32.2
Office	26.6%	2,607.1	1,623.3	671.0	178.5	134.4
Retail	21.6%	2,115.3	1,115.1	528.0	329.1	143.1
Commercial Warehouses	6.0%	591.1	287.9	204.1	76.6	22.5
Educational	17.6%	1,723.7	934.4	598.0	142.2	49.2
Health care, institutional	8.3%	813.1	469.5	194.4	76.0	73.2
Religious, public safety, recreational, other	15.3%	1,499.1	778.9	404.7	238.5	77.0
ADDITIONS/ALTERATIONS		**4,626.0**	**2,767.1**	**1,315.6**	**305.6**	**237.7**
ARCHITECTURAL SVCS.		**1,248.6**	**761.7**	**325.3**	**88.3**	**73.3**

Note that office and retail together represented almost half the 2002 commercial new construction market, followed by education (18%) and health care (8%). Warehouses, hotels/motels, and miscellaneous other buildings such as churches, prisons, and other public buildings accounted for the remainder.

Geographically, 55% of new construction was accounted for by Washington, which had almost twice as much construction as Oregon (28% of the total), which had more than twice as much as Idaho (11%), which in turn had twice as much as Montana (5.4%). Similarly, architects in the four states of the PNW reported revenues of some $1.25 billion in 2002, with Washington representing more than 60% of revenue for architectural services, compared to 26% for Oregon, 7% for Idaho, and 6% for Montana.

According to a spring 2007 report by Davis Langdon, a San Francisco-based construction cost consulting firm, the construction market in the PNW has been the strongest nationally in the last two years. As of early 2007, Idaho and Washington were the strongest markets in the region, with annual growth around 7%. This has helped push up construction costs, with prices in the region expected to rise 8-12% for the 12 months ending April 2008, continuing a trend of several years duration that has limited the ability of designers to implement some efficiency initiatives with significant added upfront costs.

Market Status

The PNW has long been among the most progressive regions in the country in its acceptance of green building and energy efficiency. This can be confirmed by the number of LEED registered and certified new construction projects in the USGBC database, summarized for 2006 and 2007 in Table 8. The PNW represents less than 4% of the national new construction market, but accounts for 14% of LEED certified (i.e., those that have completed the certification process) projects in the U.S through mid-2007. The PNW also has almost 3,000 LEED accredited professionals, including 743 architects and 116 mechanical engineers.

Table 8. LEED Projects, by state and as percent of US Totals – 2006 and 2007

		Number of LEED New Construction Projects					
		US	PNW	WA	OR	ID	MT
2006	LEED Registered	1190	102	51	43	5	3
	LEED Certified	429	67	33	31	1	2
2007	LEED Registered	NA	340	168	132	22	18
	LEED Certified	1044	145	72	64	5	4
		Percentage of US Totals					
	Certified 2007		13.9%	6.9%	6.1%	0.5%	0.4%
	Certified 2006		15.6%	7.7%	7.2%	0.2%	0.5%
	Construction Mkt.		3.9%	2.1%	1.2%	0.4%	0.2%

Source: USGBC LEED database

The overall role of LEED and sustainable design in the PNW market has grown both since last year's MPER and since the baseline survey of PNW architects conducted for NEEA by Research Into Action in 2004. In that survey, only 12% of architects reported that they were LEED accredited, compared to 32% of respondents to the 2007 survey. As interest in LEED continues to grow, the overall focus on LEED has expanded beyond larger marquee projects. A number of jurisdictions in the region require schools and other public buildings above a very small size to achieve LEED certification, and many large companies increasingly treat LEED as a way to maintain a "green" public image and achieve long term savings. Architects at Firm Focus firms and elsewhere have noted that LEED and sustainable design are almost always brought up for discussion in projects now, even if they are ultimately not attained.

LEED certification has also become more closely linked with energy efficiency. The US Green Building Council (USGBC) recently announced that all LEED projects registering after June 26, 2007 are required to achieve at least two Optimize Energy Performance points, which will count towards a project's LEED certification. To help projects achieve this new mandate, a prescriptive path has been developed for all LEED for New Construction, LEED for Core and Shell, LEED for Schools and LEED for Retail projects.

A barrier to the acceptance of LEED and other energy efficient construction approaches has been the perception that such an approach will lead to significantly higher project cost, and client focus on first cost rather than on going or life cycle cost continues to be an impediment to energy efficient design. However, a July 2007 study by Davis Langdon found that "there is no significant difference in average costs for green buildings as compared to non-green buildings",

and reported that many project teams are building green buildings with little or no added cost, and with budgets well within the cost range of non-green buildings with similar programs. The study also found that, "in many areas of the country, the contracting community has embraced sustainable design, and no longer sees sustainable design requirements as additional burdens to be priced in their bids.[6]"

Global Warming and the 2030 Challenge

Both nationally and in the PNW, interest in sustainable design has been heightened by the greater awareness of global warming and the recognition that buildings consume approximately 37% of the total energy and 68% of the electricity produced in the United States annually, according to the U.S. Department of Energy. Perhaps the most far-reaching evidence of this interest comes from the wide awareness and acceptance of the 2030 Challenge. In this highly visible national initiative, the American Institute of Architects (AIA) has adopted position statements to promote sustainable design and resource conservation to achieve a minimum reduction of 50% of the current consumption level of fossil fuels used to construct and operate buildings by the year 2010, and to make all new buildings carbon neutral by 2030.

In response to the overall AIA's promotion of this initiative, a number of individual architectural firms have formally adopted the 2030 Challenge. In addition, the Large Firm Roundtable (LFRT), a subgroup of the AIA that comprises the biggest architecture firms both nationally and in the PNW (including two of the five Firm Focus firms,) has publicly committed to meeting the 2030 Challenge. These firms are now working to attain the 2010 milestone, including developing metrics to compare their designs to the stock of comparable buildings as recorded in the Commercial Buildings Energy Consumption Survey (CBECS).

Codes and Standards

Additional evidence of the shift to more efficient design comes from new standards that will take effect over the next several years. The American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) has announced that its 2010 90.1 Standard will be 30% more efficient than the 2007 version that is currently being developed. The 90.1 Standard is the *de facto* mechanical code for most of the country, so a significant increase in its stringency will have a large effect on the entire commercial new construction market if it is adopted.

ASHRAE, the Illuminating Engineering Society of North America (IESNA) and USGBC have also jointly announced Proposed Standard 189 for the Design of High-Performance Green Buildings for new commercial buildings and major renovation projects. Standard 189P is expected to become the benchmark for all sustainable green buildings in the United States because it is being developed for inclusion into building codes, and it provides an early indication of the kinds of measures that will be required by the 2010 Standard 90.1 if it is to achieve a 30% gain in efficiency over the 2007 version. Measures required by 189P include more insulation, lower lighting densities, required overhangs, window orientation, daylighting and

[6] Davis Langdon, "Cost of Green Revisited: Reexamining the Feasibility and Cost Impact of Sustainable Design in the Light of Increased Market Adoption," July 2007

occupancy controls, demand control ventilation, reduced duct friction, continuous air barriers, cool roofs, and motorized outdoor air dampers.

Another standard recently approved and now available through the American National Standards Institute (ANSI) is the Whole Systems Integrated Process (WSIP) -- 2007 for Sustainable Buildings & Communities, developed under the auspices of the Institute for Market Transformation to Sustainability (MTS). The purpose of integrated design, according to the standard, "is to effectively manage the optimization of complex systems while pursuing sustainable practices in design and construction."This is achieved by shifting "from conventional linear design and delivery processes to the practice of interrelated systems integration.[7]"

Integrated Design vs. Integrated Project Delivery

Developers of ANSI standard are now working to reconciling the practice of integrated design as it is understood in WSIP 2007 and in green building circles with the "integrated practice" model used by AIA and others. Instead of the concept of ID promoted by BetterBricks and generally encouraged by proponents of green building, AIA has embraced what it calls Integrated Project Delivery (IPD), and recently released *Integrated Project Delivery: A Guide* as "a tool to assist owners, designers and builders to move toward integrated models and improved design, construction and operations processes. AIA defines IPD as a "project delivery approach that integrates people, systems, business structures and practices into a process that collaboratively harnesses the talents and insights of all participants to optimize project results, increase value to the owner, reduce waste, and maximize efficiency through all phases of design, fabrication, and construction."[8] While IPD appears to share many of the characteristics of ID, one of the hallmarks of the AIA IPD approach is the integration of building information management (BIM) tools into the design process, which is not an essential part of ID. Since ID focuses primarily on planning and design, it may be considered a subset of the broader IPD process.

Regional Initiatives

In addition to the development of standards supporting sustainable design, a number of regional programs are helping to institutionalize the awareness of sustainability and energy efficiency in the PNW. Washington State now requires sustainability and high-performance in the design of public buildings, while the Washington Office of the Supervisor of Public Instruction is implementing a legislated mandate that requires sustainability and high-performance in the design the state's schools.

In Oregon, Portland has an office of sustainable development that is aggressively pursuing the adoption of greenhouse gas emission reduction policies that will require energy efficiency measures well beyond code for both existing and commercial buildings. The State of Oregon has increased the Business Energy Tax Credit (BETC) in support of new buildings that meet specific efficiency criteria. While there is less of an emphasis on sustainable building overall in Montana and Idaho, Idaho Power continues to offer prescriptive incentives for mechanical equipment.

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[7] ANSI/MTS 1.0 Whole Systems Integrated Process Guide (WSIP)-2007 for Sustainable Buildings & Communities

[8] *Integrated Project Delivery: A Guide*. Introduction. AIA National, AIA California Council, 2007

Trends in Architecture

All these forces create a climate in which there is tremendous interest in sustainable design and more energy efficient buildings. The AIA, at its 2007 convention, had more than a dozen sessions devoted to sustainable design, and at the 2006 AIA convention, 5 of the top 25 seminars in terms of attendance dealt with sustainable design issues[9].

As indicated by the 80% of top AIA sessions that did not deal with sustainability, however, there are other factors that continue to play a major role in how architectural firms do business and in how buildings are designed, as reflected both in individual sessions at the AIA convention and in the presentations and notes of a 2005 forum where Large Firm Roundtable members and architecture school deans discussed trends in the profession.

- The rise in building costs mentioned earlier has been driven in part by the decline in skilled building trades workers, which could affect the ability of contractors to deliver the high performance buildings designed by architects.

- A shortage of architects is threatening to slow the design process and limit the time available to explore alternative approaches. Several IDL directors said that architects in the PNW are working to full capacity and beyond, and the number of architecture school graduates in the coming decades is projected to be barely enough to offset anticipated retirements, while many architecture graduates are going into other fields.

- Related to the shortage of architects is the growth of outsourcing. Architects at the LFRT forum noted that off-shore documents production is increasing. This has implications for the domestic profession, including the potential removal of some architects from interaction with other design team members.

- Developing technologies related to building information management (BIM) offer the potential to streamline the design process and support a more integrated approach similar to that promoted by BetterBricks. On the other hand, efforts to fully utilize BIM will mean that more sophisticated analysis tools such as energy modeling, daylighting analysis, and thermal flow modeling will have to be incorporated into the BIM framework, and there may be pressure to forego such techniques in order to achieve the cost savings potential offered by BIM.

- Another trend noted by architects in 2007 is the blurring of traditional boundaries between various kinds of contractual arrangements. Several architects said it doesn't make sense to draw a clear distinction between design-build and design-bid-build contracting, since many arrangements incorporate aspects of both approaches. However, the growing interest in sustainable buildings requires all market players, including design-build contractors, to be responsive to owner demands for more efficient designs.

[9] AIA website: www.aia.org

Seizing the Moment

For BetterBricks, the current interest in all aspects of green construction and sustainability creates a tremendous opportunity for the Design and Construction initiative. Several actions that could help BetterBricks take advantage of this opportunity are presented in the Conclusions and Recommendations section, including the need to work closely with other, like-minded organizations, leverage commitments to the 2030 Challenge and other initiatives and provide technical assistance to help organization achieve those goals, and align BetterBricks more closely with the highly visible trends described above.

4. D&C Initiative Activities

TECHNICAL RESOURCES

This chapter summarizes the activities undertaken by BetterBricks in 2007 as part of the D&C initiative. The information here is drawn from reviews of progress reports and other documents, as well as from interviews with program staff, contractors and Firm Focus firms.

Design Assistance

The number of current active projects cited in recent progress reports for the IDLs ranges from 6 to about 30 per lab. Table 8 lists the projects mentioned in the progress reports for September/October 2007. The Puget Sound IDL in Seattle and – to a lesser extent – the Portland/Eugene Energy Studies in Buildings Labs (ESBL) have a higher level of activity because they have long-term relationships with a number of architects, engineers, and utilities, as well as their Firm Focus relationships. Moreover, they serve the markets where most of the architectural activity in the region is located and they have larger budgets than the other labs.

The Puget Sound IDL in Seattle appears to be the most focused on FF projects, . Not only is it the primary contact for the relationships with Firm C and Firm D, it also provides assistance to multiple projects for the Seattle offices of Portland-based Firm A and Firm B and Montana-based Firm E. Similarly, Seattle has a majority of its projects in the target markets of healthcare and commercial real estate/offices. However, Firm C has been working with the Puget Sound lab on K-12 school projects since before the FF relationship was formalized, and while the number of K-12 school projects for which the lab provides assistance has been scaled back, both Firm C and the lab continue to take advantage of opportunities to apply integrated design in the K-12 sector.

Even before the recent signing of a formal FF relationship with Firm D, resource constraints were evident at the Puget Sound lab because there is a great deal of demand for the lab's services from both the Seattle-based firms and from the Seattle offices of architecture firms based elsewhere. The Lab enjoys excellent working relations with both the FF firms and other architects, although the FF relationship has limited the amount of work the lab is able to do. The Director of the Puget Sound IDL meets weekly with design teams from his FF partners and has been instrumental in encouraging an ID-based approach for a number of projects. Puget Sound, like ESBL and the Boise IDL is consistently having to turn away work.

In making the transition from its traditional role as "the daylighting lab" to its current focus on integrated design, the Puget Sound IDL has contracted out for engineering support, since efforts to hire a full-time staff mechanical engineer in 2006 were not successful. The lab has contracted with the Weidt Group, a Minnesota-based engineering firm that specializes in energy modeling, and so far this appears to be working well. Contracting with an out-of-area firm to do design reviews and provide technical assistance on energy modeling has the advantage of limiting the negative reaction from local project engineers, but may limit the extent to which BetterBricks is able to work toward building local capability in energy modeling through the FF projects.

In Oregon, the Eugene/Portland Energy Studies in Buildings Laboratory (ESBL) is particularly focused on its role in bringing new techniques to the design process. The reason, according to the ESBL director, is that it is necessary to develop products and processes that are faster, cheaper and better, and thoroughly document their effectiveness before most architects will actually use them. "Projects go so fast, you have to do things the way you've done them before – so you have to standardize the innovation, give them everything they need to implement it." The ESBL director also believes that rather than striving to attain fixed percentage efficiency targets, it is more important to continually develop new ways to improve energy efficiency.

While this approach helps advance the state of the art, it means that unexpected problems can arise. The Mount Angel Abbey building, designed before the signing of any FF agreements but while ESBL was working closely with firm focus Firm A, provides a good illustration of the strengths and weaknesses of this approach. The architect on the project, Firm A, was inspired to employ the large skylights on a prototype classroom developed by ESBL – a technique that allows the virtual elimination of electric lighting in classrooms during the day. This leading edge design was subsequently incorporated, along with refrigerant-free cooling and a downsized heating system made possible by night ventilation of mass, to deliver dramatic energy savings. However, the proposed design assumed that subcontractors would seal the building consistent with standards used on buildings that seek to reduce infiltration. Although the building was not formally commissioned, holes in the envelope were identified before construction was complete, but the building was not resealed. As result, infiltration problems were encountered after the building was occupied, and it was necessary to partly reseal the building and install a larger furnace. After those changes the building has operated as intended. Now there is a properly functioning building that is the subject of a BetterBricks case study on how aggressive, innovative integrated design can dramatically reduce energy usage; however, the case study makes no mention of the bumps in the road on the way to getting this building completed and functioning properly.

ESBL has several engineering firms under contract to provide engineering assistance. Energy modeling assistance and climate analysis are, however, carried out by ESBL staff. In addition, ESBL does most of the daylight modeling, since it has one of the few facilities in the region for testing physical models.

The Director of the ESBL notes that conducting research to advance the state of the art has secondary benefits in providing training for those who are involved and in exposing students to the research through classes with ESBL staff. As an example, he cites a young designer who was involved in a daylighting study while working at the ESBL but who has since gone on to join one of the FF firms. In his new role, he is serving as an effective and knowledgeable catalyst in promoting some of the techniques that he previously studied in depth.

Because the demand for its services has outstripped the BetterBricks resources available, the ESBL has had to stop taking on new BetterBricks projects; some firms, however, come up with additional funding to pay for the Lab's time. For example, Firm A, together with California's HOK, recently won the contract to design Oregon's new state psychiatric hospital (to replace the facility featured in One Flew Over the Cuckoo's Nest). Since it would be easy for this single project to use up all the available BetterBricks FF funding, the design team has agreed to pay half the cost of lab support, with BB covering the other half.

The Boise lab continues to benefit from an active new construction market and lively interest from the design community. Rather than lacking opportunities, the Boise lab is more concerned about having to turn projects away and missing chances to influence some key projects because there is not enough time to pursue them. The lab works on an average of 30-40 projects a year although sometimes the number is lower and the involvement is more in-depth. In addition to its Director and several part-time graduate students, Boise has a full-time building scientist on staff with extensive experience in energy modeling, and this has been an area of ID that the lab has emphasized. The on-staff modeling expert has also reduced the Boise lab's reliance on outside engineers, although the lab is working to build the expertise of engineering firms that want to offer modeling as a service. In addition to continuing to offer technical assistance in design and modeling, the Boise Lab is in the process of preparing four case studies that will be used in the BetterBricks marketing effort. The lab has also worked effectively with the local BetterBricks training contractor to produce a steady stream of training events and seminars.

Like Boise, the Bozeman lab is committed to using energy modeling in support of energy efficient design, but has not had the opportunity to use this on many projects. Instead, its emphasis has been on training architects and others in the use of eQuest and other modeling tools. The Bozeman lab is also outsourcing its engineering work, including modeling, to a well-qualified engineer. The signing of a Firm Focus agreement with Firm E in August 2007 should ensure the Bozeman IDL of a full workload for design assistance over the next several years. Firm E has said it is very interested in IDL assistance on a number of projects, and has agreed with the Bozeman lab's Director that they will work on about 3 projects per quarter.

For BB, the FF relationship with Firm E helps BB provide services to the Eastern part of the region, which addresses a complaint often voiced by utilities in that region that NEEA tends to ignore them; it also helps ensure that the Bozeman IDL has an opportunity to more fully utilize its ability to provide design assistance. Finally, it helps address several of the target markets, since Firm E has done extensive work with groceries, hospitals, and commercial real estate.

In Spokane, the focus continues to be on building relationships with architecture firms and seeking projects to work on. Historically, Spokane has been slow to adopt new ideas in design fields, and energy efficiency is simply not yet a driving force in design projects. While there have been a few projects where the design team is receptive to assistance, the challenge has been to get involved early enough to significantly influence the design. According to the Director of the Spokane IDL, most of the contacts she has made result in "planting seeds" so that owners or architects will come to the lab for assistance in the earlier stages of future projects.

As suggested by data from the monthly progress reports summarized in Table 9, IDL resources are committed to a number of projects both within and outside the BetterBricks target markets[10]. Schools continue to offer opportunities for all the labs, and the Director of the Eugene ESBL routinely includes a comment in the monthly report that "Interest in high-performance classroom continues. ESBL is having to turn down meetings with school districts, and other interested individuals due to time and budget constraints." The lab directors continue to say this market offers numerous opportunities to influence the design of prototype schools and classrooms in

[10] Note that these projects represent a broad range of involvement on the part of the IDLs.

ways that incorporate daylighting, natural ventilation, and other elements of ID[11]. It is noteworthy that the new BetterBricks website implicitly confirms this assessment by having a separate tab for K-12 schools along with Design and Construction, Building Operations, and the target markets of Hospitals, Groceries, and Real estate.

Table 9.: September 2007 Project Involvement – by IDL

Eugene-Portland IDL (ESBL)	Puget Sound IDL
Healthcare	**Healthcare**
FF: Shriner's Hospital for Children, Portland, Oregon	FF: St Joseph's Orthopedic Rehabilitation Center, Spokane
FF: Emmanuel Children's Hospital, Portland	FF: Seattle Children's Hospital Expansion, Master Plan
Offices	FF: Seattle Children's Hospital Energency Room Addition
FF: Port of Portland Office Building and Parking Garage	FF: Whidbey Gen. Hospital EMS, Coupeville
Crescent Village Office Building, Eugene, Oregon	FF: Enumclaw Regional Hospital
K-12 Schools	FF: U of WA Medical Center, Tower addition, Seattle
FF: Thurston Elementary, Springfield	FF: Virginia Mason Hospital, Patient Tower addition, Seattle
FF: Da Vinci Arts Middle School, Portland, Oregon	FF: Providence Hospital, Newberg
non-FF: Damascus High School	FF: Mercy Medical Center Master Plan, Nampa, ID
non-FF: Happy Valley Elementary and Middle School School	**Offices**
Other	FF: 5th and Columbia Tower, Seattle
FF: Alumni Center, U of O, Eugene	FF: Microsoft Office Building, Redmond
FF: Student Recreation Center, Portland State University	FF: Conagra Office Building, Richland
FF: Spokane Falls Community College, Spokane	FF: Nintendo Office Building, Redmond
Boise IDL	FF: 5th and Columbia Tower, Seattle
McCall Donnelly High School Renovation / Addition, McCall	Vulcan Office Project, Seattle
David Aspritarte Office Building, Boise	PSE Factoria Service Center, Factoria
Meridian City Hall, Meridien	Occidental Trolley Tower Office Bldg., Seattle
Fred Meyer - Tacoma Remodel	non-FF: Columbia Credit Union Branch Office, Vancouver
St. Alphonsus RMC - South Tower Remodel, Boise	Kitsap SEED Office Building, Bremerton
Fairmont Elementary School - Boise School District	**K-12 Schools**
Twin Falls High School	FF: schools projects in WA:
SC1 (Boise Rescue Tower) - Front & Fifth. Boise	Lake Washington High School, Seattle
Donnelly Elementary School, Donnelly	Bethel Junior High
Lake Ridge Elementary School, Nampa	Muckleshoot K-12 School
Lone Star Middle School, Nampa	FF: schools projects in OR:
Grocery Chain projects (w/ Engineering Consultants, Inc.)	Clackamas Elementary
Bozeman IDL	North and South Medford High Schools
FF: Cody Airport, Cody WY	McMinnville Elementary
Burgard Office Building, Bozeman	Springfield Elementary
Kalispell Regional Medical Center, Kalispell	**Colleges and Universities**
Lincoln Elementary School, Riverton	non-FF: North Seattle Community College Employment Offices
Bozeman Middle School, Bozeman	FF: Cornish College of the Arts Music School Building
Polson High School, Polson	**Other**
Spokane IDL	City of Seattle Firestation 30
Post Falls (ID) City Hall	
Gonzaga University: Herak Engineering Building, Spokane	
Benton High School, Benton City	
Mount Carmel Hospital (Providence), Colville	
Armed Forces and Aerospace Museum, Spokane	
Whitworth College Visual Arts Building, Spokane	
Coldwater Creek Offices, Coeur d'Alene	
Moses Lake Elementary School	

[11] Schools were approved as a vertical market in 2001 but stopped receiving dedicated funding in 2005. The Labs are still free to do school-related work but as a secondary priority after the current three BetterBricks' vertical markets. BetterBricks continues to focus on schools through the provision of broader education and information rather than technical support.

Education and Training

In providing direct assistance on individual projects, all of the labs use a "project-based education" approach, where the IDL transfers knowledge to the architects at the FF firm by interacting with design teams for individual projects to implement and identify opportunities for ID. While the Letters of Agreement with FF firms have called for the IDLs and the Business Advisors to provide education to FF staff through periodic Brown Bag seminars and design reviews, these have been relatively limited, in part because a complete curriculum describing the basic tenets of ID had not been available until recently. Now that Better Bricks, with input from the IDLs, has developed a standard description of the ID process and its benefits, in-house training at the FF firms is expected to become more common.

The IDLs are also involved in developing and delivering training and informational material for the broader market. The ESBL has taken a leading role in helping to define and refine the concept of ID so that it can be more readily explained and implemented, with all the IDLs involved in reviewing and refining the material. This work led to the development of a presentation that will serve as the core source material for the BetterBricks Education & Training and Marketing teams to develop materials on ID. Similarly, the Puget Sound IDL has been doing hospital performance research related to energy, patient and staff health and productivity for the last two years, including energy modeling on design scenarios.

FIRM FOCUS APPROACH

For this second MPER, evaluation interviews were conducted with key members of all participating firms except Firm D as that relationship was not formalized until after FF interviews were completed. Observations regarding Firm D and the FF relationship are drawn largely from interviews with the BetterBricks Business Advisor and the IDLs. For firms that started in 2006, questions were designed to assess their perception of how the FF approach was working and how it had affected their business and design practices to date. For Firm E, which had its FF kickoff meeting in October, the evaluation assessed perceptions of and expectations for the FF relationship

Of the three firms selected and signed up in 2006, Firm A and Firm B are working primarily with the ESBL, and Firm C is working with the Puget Sound IDL, although each firm has offices in both Seattle and Portland and Firm B in particular is working extensively with the Puget Sound IDL. For Firm D, the primary contact will be with the IDL in Seattle, where Firm D has more than 300 employees. Firm E, with 10 offices in Montana, will work through the Bozeman IDL.

Status by Firm

All of the first three FF firms are now well into their second year of involvement with the Initiative, so it is appropriate to consider how much progress has been made by each and whether it is realistic to assume that the business practice at every firm will have been sufficiently transformed so that further BB involvement is not needed after the three-year FF contract.

Firm A (Portland and Seattle)

Firm A appears to be farthest along in having made ID integral to its practice. According to both the Director of the ESBL and the firm's Managing Partner, Firm A actively promotes ID in essentially all of its projects. As the director of the IDL notes, "More owners are asking for sustainable, and firms will develop the capability. But at Firm A it's not just what the client wants, it's what they want to do; it's not just reacting to the owner."

In addition, the firm has made a company commitment to the AIA 2030 Challenge. The BetterBricks Business Advisor explains that "Firm A came up with a sustainability strategic plan and made it their own. They added their own language and set up people to see that it got done." The firm's Managing Partner explains that they have reduced the firm's own carbon footprint and have also made a commitment to have 100% LEED accredited professionals on staff (they are currently at 85%, including 100% of their Seattle office).

The commitment to ID by Firm A is undoubtedly made easier by the relatively small size of the firm: about 50 people in Portland and 20-25 in Seattle. Within Firm A, the design partner in charge of one studio has long been an innovator in applying ID and in advancing the state of the art. His close working ties with BetterBricks and the ESBL have helped to bring the other partners and their studios fully on board. Firm A is building ID into most of their proposals. The ESBL director says that "All the major partners have been converted, and they routinely ask us to participate."

Firm A's Managing Partner notes that "the issues that influence energy efficiency and sustainability come up very early and there's a much greater emphasis on getting data, like climate information, that will help us even at the very early stages. Expectations regarding sustainability are more strongly raised and have a much greater influence."

If any FF firm could be considered sufficiently transformed after the three year period of FF participation, it would probably be Firm A. As the Managing Partner stated: "After 3 years, are we able to breathe on our own? In the first year we were just figuring it out. This year clearly we've substantially engaged Integrated Design in our projects. In 08 we need to really push to take even more advantage of that."

It is likely that even without BetterBricks, Firm A would continue to engage the ESBL on its own for design assistance on individual projects. "One of the keys for our use of ESBL is going to be how that organization evolves," says the Firm A Managing Partner. "It's become such a valuable resource to the profession, and I don't know how many cities have that kind of resource or what we would do without it."

Firm B (Portland and Seattle)

With approximately 200 employees and offices both in Portland and Seattle, Firm B is one of the largest architecture firms in the PNW. Together with Firm D it represents about half the hospital design market.

Firm B represents somewhat of a paradox for the BetterBricks initiative. On the one hand, senior

managers at Firm B have said they are not interested in assistance with strategic planning and business development and have chosen not to share marketing and other strategic plans with the FF business advisor. On the other hand, Firm B has taken a number of steps that demonstrate an active commitment to high performance buildings and integrated design. Specifically the firm has done the following:

- Created and expanded a sustainable design group within the firm
- In the fall of 2007, held a firm-wide roundtable on sustainable design attended by 45 of their staff
- Made a commitment to the 2030 Challenge as part of their membership in the Large Firm Roundtable of the AIA
- Started the process of benchmarking their designs against the efficiency of existing buildings for the 2010 goal of making new buildings 50% more efficient than the current building stock
- Helped prepare and actively promoted the results of a study conducted with the ESBL on daylighting in hospital rooms, and incorporated the findings into their standard hospital designs
- Won awards for the energy efficient design of an EPA building in Colorado (with assistance from ESBL), and used the BB marketing team to promote efficient design
- Is designing a zero net energy building in Oakland, California

Despite having failed to incorporate ID into a strategic plan, the above activities indicate that Firm B is clearly pursuing ID in its project work and helping to achieve the outcomes set forth for the D&C initiative. They are working with both the Portland and Puget Sound labs, and have also utilized the services of the BetterBricks marketing team to develop marketing materials, prepare case studies and pursue speaking engagements. Although some of the terms of the original FF agreement (i.e., the role of the Business Advisor) have not been met, the size and influence of the firm lead us to believe the FF relationship should be maintained.

Firm C (Seattle and Portland)

Firm C has its main office in Seattle, where the FF involvement evolved from an established relationship between the firm's Design Principal and the Puget Sound IDL. Most of that previous work had involved daylighting for High Performance schools, and one of the goals of the FF relationship was to encourage Firm C to use the full ID approach in other markets besides schools, as well as to change their business and marketing practice. The Business Advisor notes that "the relationship has continued strong, but what they expect from the lab is shifting, and that has been the real change."

The IDL Director meets with Firm C once a week, and is currently working on about a dozen projects with them. Although they still have several schools both in Oregon and Washington, more other projects have been added, including two regional hospital projects, a master plan for

a hospital campus, and several office buildings. The firm also received extensive recognition for their design of the Providence Hospital in Newburg, the first LEED hospital in the country, which is currently going through a post-occupancy evaluation developed and guided by the Puget Sound IDL.

Firm C has also worked closely with the Business Advisor and the BetterBricks marketing team, which helped write or place a number of stories related to the Newburg Hospital. The Business Advisor reports that tracking of progress on the Strategic Plan has tended to be overshadowed by the volume of current work that has to be done, but that Firm C has adopted key aspects of the ID approach into its core values, and continues to incorporate ID in its major hospital projects as well as the schools it designs. The firm believes that "one of the reasons we won" the regional hospital project mentioned above was their integrated approach to the design process.

While the firm is committed to ID, is has been in the midst of a transition in senior management teams that shapes the overall approach to project design as the firm moves away from a traditional approach that the Business Advisor refers to as the "architect as form-giver model" where the architect designs the shape of the building and leaves it to the engineers to make it function. The new, more collaborative approach is essential to full adoption of ID.

When asked about the end of the FF relationship after three years, the Marketing Manager at Firm C said he finds it hard to picture the firm's continuing transition to ID without access to the Puget Sound IDL. "If they look at whether you are able to do it yourself, the hardest part of that is would our use of the lab be gone? We would like it to continue – we're hoping it will continue."

Firm D (Seattle)

Among all the FF firms, Firm D is by far the largest; in fact it is one of the largest firms not only the PNW but in the country. More important, it is one of the largest firms serving the healthcare market; with the combination of Firm B and Firm D, BB can now claim FF relationships with firms accounting for about half the hospital square footage designed in the PNW.

Because of the size of the firm, a concern about Firm D has always been that a FF relationship would quickly exhaust all the available resources from the associated IDL – in this case the Puget Sound lab. This has been dealt with by establishing the FF relationship with a single studio that specializes in healthcare; even there, this studio has enough potential projects that resources will have to be focused selectively. Even before the FF relationship had been formally signed, the Puget Sound IDL had worked with Firm D on several smaller projects and was considering working on a large hospital project.

Despite concerns about the potentially overwhelming demand for IDL services, all the players – BetterBricks, Firm D, the Seattle Design Lab and the BB Business Advisor -- are excited about this new FF relationship. For Firm D, the timing was perfect. Firm D was approached in 2006 about initiating a relationship but was not interested at that time. An indication of the change taking place in the market is the fact that Firm D, responding to pressures both from clients and from internal staff, had decided to place more emphasis on sustainable design. Like Firm B, it had committed to the 2030 Challenge as part of the Large Firm Roundtable, and it had launched

its own internal version of the 2030 challenge specifically for hospitals. The BB FF relationship offers Firm D a way to help work toward that goal.

Firm E (Billings, Boise, Seattle, eight other PNW cities)

Based in Montana, Firm E is by far the largest PNW architecture firm east of the Cascades. Firm E is a true A&E firm, with mechanical engineering in-house. Headquartered in Billings, Firm E has 14 offices in all and 11 in the PNW, including all the major cities of Montana. Firm E has projects around the region and serves all of the BetterBricks target markets. IDL-Bozeman will be the lab lead on this relationship and the Business Advisor will handle the business practice side.

While this effort is just beginning, Firm E is very interested and willing to incorporate ID into their practice and into their business model. They already have 50 LEED accredited staff and are eager for help on their strategic plan and technical development. Firm E management is excited about the FF relationship. Their primary concern when they first heard the details of the relationship was that it seemed too good to be true; they were reassured by the involvement of the Bozeman Lab Director, who is a highly regarded member of the design community as well as Professor of Architecture at Montana State University in Bozeman, and by the fact they had worked with other FF firms, several of which had Firm E "alumni" in key positions. They have had extensive discussions with the BB Business Advisor and are planning to use both their resources and the design assistance of the IDLs on up to three projects per quarter. The firm has several projects that are in early design where the client has expressed an interest in ID.

Firm E's expectation is that the design assistance will help them regain a focus on efficient design that the firm had in the early 90s. They are also hoping that working with the Business Advisor will give them feedback on how they are positioning themselves and how they may be able to compete beyond their somewhat isolated market. Firm E's Managing Director recognizes that committing to an integrated design approach could mean major changes in their business. "We think there's a chance that our volume may decrease," he says, "but over the long term, that (sustainable design) is where we're headed as a society and as a firm."

Business Advisor Services

Specific tasks undertaken by the Design and Construction Market Business Advisor in 2007 were similar to those defined in the letters of agreement between NEEA and the individual FF firms, and generally included:

- Assistance in advancing the development of the FF strategy and planning for implementation, including reviewing and refining introductory presentations and assisting in firm selection and coordination.

- Assistance to the FF firms in aspects of their Strategic Plan and Business Plan to assure that the firm's overall vision, goals and objectives integrate high performance and energy efficient design and to help identify strategies and activities that will advance the firm's broader vision of leadership in Integrated Design.

- Evaluation of each firm's culture and processes and suggesting ways to improve practices to more effectively deliver ID.

- Advising selected firms in marketing plans, marketing strategies, proposal language and marketing materials to use concepts of high performance and integrated design to the firms' advantage.

For Firm A and Firm C, strategic plans describing the firm's commitment to ID were prepared and have been adopted by the senior management at each firm. Progress is being tracked, and both firms appear to be taking their commitments seriously. At Firm B, there has been reluctance among senior management to adopt a formal strategic plan, apparently because this would involve having the Business Advisor review documents that the firm thinks of as proprietary and confidential. While Firm B has rejected extensive involvement by the Business Advisor, they have continued to work closely with the labs on individual projects, both in Portland and Seattle, and are actively building and promoting their ID capability.

At Firm D and Firm E, the review of existing practices was initiated in the fall of 2007, and both firms appear to be extremely receptive to the Business Advisor's review and subsequent recommendations.

It is worth noting that all of the FF firms expressed a high degree of satisfaction with both the technical assistance provided by the IDLs and the business/marketing assistance provided by the business advisor. All said they recognized the demands on the IDL Directors, but none said they had found them in any way unresponsive. In cases where the Labs had to say that an increased level of involvement was not possible within the constraints of the contract or the budget, the representatives of the architecture firms said they fully understood.

Similarly, while not all of the FF firms had made extensive use of the marketing support available to them, they were aware of its availability, and said they could have used it if they had made an attempt to do so. Those who had used this resource were pleased with the results.

The BetterBricks Design and Construction goal of achieving 25% energy savings seems largely to have been superceded by the emphasis on the goals of the 2030 Challenge and the 2010 Initiative. The 25% level of savings (and sometimes more) compared to code is already achieved on a growing number of projects, although several architects and marketers noted that all the estimates of savings from alternate designs to date have been theoretical or based on modeling results. The Firm Focus firms are very interested in seeing post-occupancy verification of actual energy usage, with several emphasizing that they thought this was critical to the credibility of marketing efforts. One architect cited a conference where building owners commented that they were being promised so much by architects, but that there were few objective evaluations of the actual payoff.

To address this need, BetterBricks is pursuing a number of post-occupancy evaluations (POEs), both through the IDLs and in partnership with owners, consultants or utilities. Examples include: Seattle City Hall, Providence Newberg Hospital, Westlake Terry office building in Seattle, Oregon Health Science University Center for Health and Healing and a number of K-12 Schools. In addition to collecting needed data on actual building performance, BetterBricks hopes to

promote the practice of POE so that owners will demand it and architects will offer it.

EDUCATION AND TRAINING

Public education through BetterBricks Education and Training (E&T) staff and contractors has been delivered to the broader market in the region throughout 2007. Much of the education was in partnership with the IDLs; in many cases, efforts were made to partner with other market associations and organizations, such as AIA, BOMA, ASHRAE or the Cascadia Chapter of USGBC. Table 10 summarizes the education activities by state and subject matter. Note that the table includes both training-oriented seminars such as those hosted by the IDLs and other activities with an education or training component, such as energy expos and conferences. A number of training activities are presented both locally and region-wide through the use of webinars, which allow interested individuals to see and hear the presentation over the internet.

During 2007, E&T staff and contractors also worked with the Integrated Design Labs to develop an ID curriculum for public education. It should be noted that the lack of content up until recently has limited within-firm training efforts and thus the diffusion of knowledge through the FF firms. Several representatives of FF firms noted that there had been very few of the "brown bag" sessions that were expected to help diffuse the knowledge regarding ID throughout a firm. One of the key training presentations being developed is designed to teach architects "How to Sell Integrated Design." The Business Advisor developed the basic content of this presentation, but needed many more examples to make the content effective. Getting that input from the labs ended up taking the better part of the year. As of late Fall 2007, the curriculum was said to be ready for use, but it had not yet been presented at any of the FF firms.

While the topics for most of these activities were not directly about ID, many are related to or components of the new ID concept. Several sessions specifically addressed the topic of Integrated Design in the real world, covering lessons learned from such high performance buildings as the Mount Angel Abbey, Rosa Parks Elementary School in Portland, and the Gerding Theater in Portland.

Table 10.: 2007 BetterBricks Training Activity by State and Topic

Topic / Event	WA	OR	ID	MT	PNW-wide	Total
New Construction/Integrated Design	5	16	9	1		31
Lighting / Daylighting	6	3	3	3		15
Vertical Mkts (Hosp, Schls, Groc.)	3		2		2	7
Total	25	29	18	4	5	81

Education and Training Events related to Integrated Design have generally been well received by those who attended them, based on event evaluation forms filled out on site by participants. For example, the Integrated Design Meets Real World session on the Mount Angel Abbey received a usefulness rating of 9.1 on a 1 to 10 scale from 29 attendees. Similarly, architects who had

attended BetterBricks training gave it a mean score of 4.4 on a 1 to 5 scale, indicating a high degree of satisfaction.

MARKETING

Marketing is a key component of the BB market transformation strategy, with the goal of building broad market awareness through the dissemination of success stories, case studies, and other news of the effective application of energy efficient design strategies. The BetterBricks marketing team also works closely with both the FF firms and with the Business Advisor to make each firm's ID capability a key selling point in collateral, proposals, PR and other marketing materials. In 2007 the marketing team assisted the FF firms on several significant projects, including a case study, a white paper and several speaking opportunities and article placements. Examples include the following:

- A 2005 Firm B/ESBL research study on Daylighting Patient Rooms in Northwest Hospitals was summarized into a four page summary titled Daylighting Hospital Patient Rooms.

- The Guide to the Design and Construction of High Performance Hospitals was prepared, including case studies of the Providence Newberg Medical Center and the OHSU Center for Health and Healing.

- A brochure was prepared presenting the case study for The Mount Angel Abbey case study, for which FF firm Firm A was the architect

In addition, marketing support continues to be provided to other vertical markets not currently targeted and to the IDLs for efforts not related to FF. An example of the former is an ongoing effort to reach out to school decision-makers to promote success stories related to energy efficient design for schools; an example of the latter is the work being done on collateral and other materials to create a consistent look for the IDLs. All labs but the ESBL now have websites with a consistent look and IDL logo, and all five are accessible via links on the new BB website.

Marketing also organized BetterBricks Awards events in Seattle, Portland and Boise, to honor the leaders behind the best high performance building projects in the Northwest. Judging criteria included the consideration of substantial energy savings, enhanced productivity of building occupants, local climate and employing early design decision-making. Each of the events included winners for design and construction. The BB Awards continue to grow in visibility and importance. BB supports the development of advertising inserts for major local business papers in each city in conjunction with the awards ceremony held for each region. Attendance at the Portland awards (the 5th held) was about 280; in Seattle (the 2nd) it was over 180, and in Boise (the 4th) it was more than 130.

Marketing recently completed the re-development of the BetterBricks website, and D&C has a large presence on it. It went live in November of 2007. This and other marketing activities influencing all the cross-cutting and vertical markets targeted by BetterBricks would be appropriately assessed by a separate cross-program evaluation.

UTILITY COORDINATION

All of the IDLs work closely with the utilities in their region. The Puget Sound IDL continues to refer the design projects they work on to available utility programs, and maintains close relationships with utility representatives from Seattle City Light and Puget Sound Energy. In Idaho, the Boise IDL has a representative from Idaho Power on its Advisory Committee and Idaho Power also helps fund the Idaho IDL. Both the Bozeman and Spokane IDLs are working with their local utilities to help establish relationships with A&E firms, and Northwest Energy was instrumental in the identification and signing of Firm E as a Firm Focus Partner. In addition, the Eugene/Portland ESBL has an ongoing relationship with the Eugene Water and Electric Board, providing design assistance to local architects and engineers for 18 years on more than 80 projects.

As part of the research for the current round of BetterBricks MPERs, a survey was conducted with 38 utility staff across the PNW. Results of these surveys are discussed in Section 6.

5. Architect Survey

To assess market progress over time, evaluators conduct surveys of target audiences to determine their awareness and knowledge of elements important to the initiative. The initial surveys are considered baselines; the first of these, for architects, was conducted in 2004 by Research Into Action[12]. The architect survey was repeated in the second half of 2007 for the current evaluation; results are presented here, along with a comparison of selected findings to the 2004 results. It should be noted, however, that since the focus of the BetterBricks Design and Construction initiative has shifted toward promoting the specific approach known as Integrated Design, questions were refocused on that approach, so that direct comparisons with the previous survey will be limited.

2007 Architect Survey Results

Interviews were conducted with architects in all four Pacific Northwest states. Dun & Bradstreet data were used to compile a list of architecture firms by state and by number of employees. While similar sources were used to compile the two samples, the sample for the current survey was developed independently. The data indicate a population of architecture firms (including residential and industrial as well as the commercial and institutional designers targeted by this survey) shown in Table 11.

Table 11.-- PNW Architecture Firm Population

No. of Architecture Firms	With 25+ emps	With 10-24 emps	With 5-9 emps	With 2-4 emps	With 1 Emp	Total Firms
ID	3	18	26	51	77	175
MT	1	13	25	61	49	149
OR	18	29	59	162	214	482
WA	35	88	139	340	458	1,060
Region	57	148	249	614	798	1,866
No. of Employees at Arch. Firms	**With 25+ emps**	**With 10-24 emps**	**With 5-9 emps**	**With 2-4 emps**	**With 1 Emp**	**Total Employees**
ID	123	259	166	145	77	770
MT	25	173	167	159	49	573
OR	1,179	440	363	414	214	2,610
WA	2,237	1,197	886	854	458	5,632
Region	3,564	2,069	1,582	1,572	798	9,585

Source: Dun & Bradstreet data from zapdata.com

Note that some 9,500 people are employed at almost 1,900 architectural design firms in the PNW. Based on the survey results (with respondents asked both the total number of employees and the number of architects in their office) we would expect approximately 30-35% of those employees to be architects, indicating that there should be some 3,000-3,500 architects at architectural firms in the region. Note also that the number of employees of architecture firms seems to follow the breakdown of Architectural Services receipts shown in the Market

[12] A full report is available at http://nwalliance.org/research/reportdetail.aspx?ID=146

Characterization, with Washington having roughly twice as many employees as Oregon, which in turn has roughly twice as many employees as Idaho and Montana combined.

Because the D&B list included only a single contact name per firm, and since the focus of the baseline survey was on individual architects, additional sources of names were used to identify other architects at these same firms – particularly the larger firms where it would be appropriate to contact multiple respondents. These sources included:

- Lists of AIA members
- Trade publication lists
- The NEEA database
- Referrals from the design labs

Using these sources and refining the names to the extent possible (e.g., removing duplicates, deleting names with the title interior designer, landscape architect or engineer), 2,455 individual names were identified at the 1,866 firms, although some of these still proved to be non-architect employees of the architecture firms. In most cases, both senior level architects (owner, partner, designers, project architect) and rank-and-file architects were included in the names for a given firm. For this survey, we specifically sought out respondents at both levels because the goal was to obtain information on architecture activities and practices at the individual architect level to assess how widely awareness and adoption of integrated design practices have spread.

Not surprisingly there were a number of architects who said they simply did not have time to respond or who did not return repeated phone messages or voice mails, while 84 of the architects contacted said they did not design commercial buildings and 64 did not meet the criterion of having designed at least 3 buildings or 50,000 square feet of commercial space. In all, 97 interviews were completed with respondents at 89 firms. A call disposition is shown in Table 12.

Table 12.-- Architect Baseline Call Disposition

Disposition	Number
Complete	97
Interview scheduled, not kept	5
Left messages, calls not returned	587
Call back	169
Not commercial architects	84
Did not do 3 buildings or 50,000 sq ft	64
No answer/busy	37
Refused	105
Retired/no longer works there	34
Phone disconnected/out of business	33
Total numbers dialed	1,215

Based upon the diverse size, markets served, location and scope of services of firms completing the survey, we do not believe there was any systematic response bias. The relative precision of the results is $\pm$16% at the 90% confidence level. For a sample of 97, the 90% confidence interval around a proportion estimate of .5 is $\pm$ .08 (i.e. .42-.58), which represents 16% of the estimate.

The survey instrument is provided in Appendix A.

Survey Results

Respondent Profile

The number of architects in the offices of respondents ranged from 1 to 325, averaging 17.9. Most respondents worked for single office firms, but 18% said their firms had other offices in the PNW, with a total of 606 architects. Characteristics of responding architects are summarized in Table 13.

Table 13.-- Respondent Characteristics

Number of Employees	1-4	5-9	10-24	25+
ID & MT (n=32)	25%	31%	28%	16%
Oregon (n=35)	43%	11%	20%	26%
Washington (n=30)	23%	20%	10%	47%
PNW	31%	21%	20%	29%
Number of Architects	1-4	5-9	10-24	25+
ID & MT (n=32)	59%	25%	6%	9%
Oregon (n=35)	57%	11%	9%	23%
Washington (n=30)	47%	23%	0%	30%
PNW	55%	20%	5%	21%
Square feet designed	<249 K	250-500 K	501 K-1 MIL	>1 MIL
ID & MT (n=32)	63%	28%	6%	3%
Oregon (n=34)*	53%	24%	15%	9%
Washington (n=30)	67%	17%	7%	10%
PNW	60%	23%	9%	7%
** One Oregon respondent did not provide the number of square feet designed*				
No. of Buildings Designed	<10	11-25	26-50	>50
ID & MT (n=32)	53%	31%	13%	3%
Oregon (n=35)	66%	26%	6%	3%
Washington (n=30)	77%	20%	3%	0%
PNW	65%	26%	7%	2%

The number of buildings that respondents reported being personally involved in designing since the beginning of 2006 ranged from 1 to 100 and averaged 12, with more than 90% of respondents working on 25 or fewer buildings. Similarly, while the square footage of PNW projects ranged from 50,000 to 2.5 million, for a mean of 349,000 square feet per architect, more than 60% of respondents designed fewer than 250,000 square feet, with a few owners, partners, or design principals at large firms skewing the mean higher.

The breakdown of design work by state, sector, and contract type for the interviewed architects is shown in Table 14. To obtain region-wide totals, results for individual states were weighted according to the percentage of architectural services accounted for by each of the states according to the 2002 Economic Census (see Market Characterization chapter). These weights are: Washington - .61; Oregon - .26; Idaho and Montana - .13.

Table 14. – Architectural Practice of Respondents

	All (weighted)	WA (n=30)	OR (n=35)	ID & MT (n=32)
By State	% of sq. ft.	% of sq. ft.	% of sq. ft.	% of sq. ft.
Washington)	58%	86%	18%	3%
Oregon	27%	9%	81%	5%
Idaho	9%	3%	1%	51%
Montana	7%	2%	0%	41%
By sector				
Hospital/medical	12%	10%	14%	17%
Grocery stores	1%	0%	3%	0%
Other retail	20%	21%	21%	13%
Office buildings	30%	36%	13%	34%
K-12 schools	8%	7%	9%	8%
Colleges and universities	7%	6%	9%	6%
Other	22%	19%	30%	22%
Owner-Occupied vs. Developer-Built				
Owner Occupied	59%	55%	59%	78%
Developer-Built	41%	45%	41%	22%
Design-Build vs. Design-Bid-Build				
Design-Build	38%	48%	21%	28%
Design-Bid-Build	60%	52%	75%	68%
Hybrid or negotiated	2%	1%	4%	4%

The results by state show relative consistency across sectors, with the exception of a low percentage of office buildings for Oregon, which was offset by a higher percentage share of "other" building types, including mixed use, public facilities (community centers, museums), and hotels. Oregon also had the only respondents who reported significant activity designing grocery stores in 2006-2007. Idaho and Montana had a much higher percentage of owner-occupied buildings, in part because of their higher percentage of hospital/medical buildings.

Despite the growing popularity of design-build (DB) contracts, design-bid-build (DBB) arrangements still represent about 60% of the work done by PNW architects. Several respondents noted, however, that the DBB practiced today is rarely the traditional version where the design and construction aspects of the new construction process are wholly separate. A partner at a Firm Focus firm noted that "We see more and more hybrid arrangements, and few that are classic design-bid-build. We do multiple bid packages, release parts of a project at a time, and then do design-build on the mechanical. Almost nothing is clean anymore."

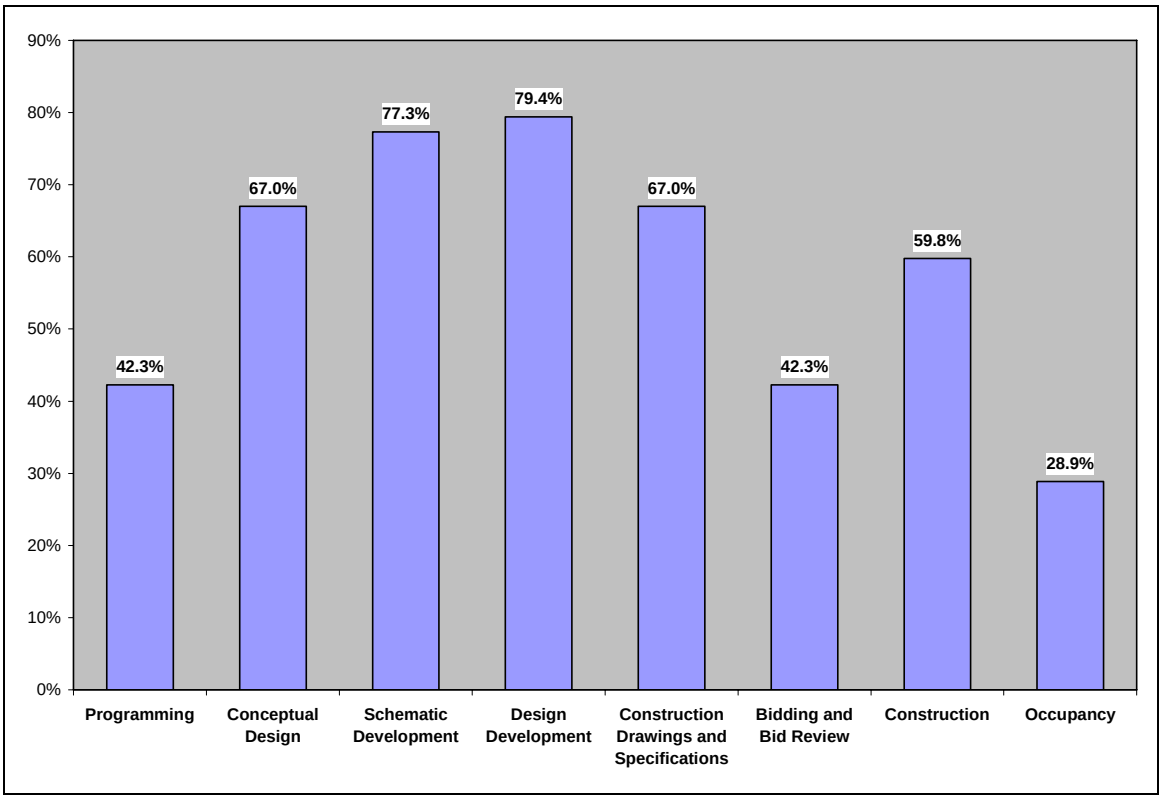
Design Practices

Whole-team meetings

One of the tenets of the ID approach championed by BetterBricks is the importance of early involvement of all members of the design team in the design process. Judging from the responses offered by surveyed architects, such whole-team meetings are fairly common, particularly during schematic development and design development. As shown in Exhibit 1, however, team meetings are less common during the programming phase when many critical design decisions

are made. In addition, the results show that there is little post-occupancy follow-up on the part of the design team as a whole, which limits the extent to which lessons can be learned on individual projects and incorporated into future work.

Exhibit 1 – Frequency of Whole-Team Meetings



The fact that more than 85% of architects report holding whole team meetings on at least some projects suggests that this critical precondition for the adoption of integrated design techniques has been met. It has been pointed out, however, that just because team meetings took place does not mean that integrated problem defining and solution development occurred. Future research will investigate in greater detail the substance of topics discussed at these meetings and their effect on the design process.

Firms that appear to have made whole-team meetings standard practice are more likely to initiate these meetings during the earlier phases of design. Almost 90% of architects who say that they participate in whole-team meetings on projects representing 75% of more of the square footage they design report initiating those meetings during the programming or conceptual design phase.

Awareness of Integrated Design

Another indication of the receptivity to integrated design is the extent to which owners ask for high performance or sustainable buildings, as reflected in responses to several questions, shown in Table 15. Projects representing almost half the square footage designed by responding architects were said to have clients who made energy efficiency a priority, and about one-third of projects were reported to have energy efficiency performance goals or benchmarks other than

code, reflecting the high degree of interest in LEED, particularly for government, educational and institutional buildings. Architects also said that almost one-third of their floor area since the start of 2006 was designed to be at least 10% more energy efficient than code, while 17% was designed to be at least 25% more efficient – the target for the BetterBricks Design and Construction initiative. Results were influenced by four Oregon architects who reported designing more than 800,000 square feet and also said 50% or more of their floor area was designed to be at least 25% more efficient than code.

On the other hand, efficient designs are not always built as designed – respondents said that 26% of their projects had aspects of energy efficiency related design decisions overruled or deleted – usually on the basis of cost (i.e., the belief that a less costly approach would work as well.)

Table 15. – Indicators of Efficient Design Priority

Metric*	All (n=97)	WA (n=30)	OR (n=35)	ID & MT (n=32)
Percent of square footage for which rebates received	25%	24%	32%	10%
Percent of square feet w/ clients who made energy efficiency a priority	47%	58%	56%	23%
Percent of square feet w/ energy efficiency goals or performance benchmarks other than code	31%	43%	37%	11%
Percent of floor area designed to be at least 10% more energy efficient than code	31%	20%	51%	15%
Percent of floor area designed to be at least 25% more energy efficient than code	17%	9%	31%	7%
Percent of projects where aspects of energy-efficiency related design decisions were overruled	26%	20%	25%	29%

* Results are weighted by square feet designed in PNW

As shown in the table, incentives also continue to play a role in influencing the market, with architects reporting that projects representing about 25% of square footage receive utility rebates.

To determine the extent to which architects are familiar with integrated design, they were asked directly if they are familiar with the concept; if they said yes, they were asked to define the concept in their own words. While 86% said they were familiar with the concept, two of those respondents were unable to offer any definition, and about one-third offered definitions that did not include such key attributes of integrated design as a focus on energy efficiency; the integration of climate, usage and design; or the cooperation of the entire design team. On balance, however, it appears that a majority of commercial architects in the PNW have a reasonable understanding of the basic integrated design concept.

Respondents were also asked to define benefits to the owner of having their building created using integrated design. Almost all architects pointed out the benefits of long-term cost savings through energy efficiency, and about half also noted the improved productivity, lease rates, or overall livability of a building constructed using integrated design. Smaller fractions of

respondents noted the potential for reduced first cost, fewer change orders, and the benefits of a green image for the building owner.

Because it is difficult to assess the extent of integrated design adoption through the somewhat imprecise definitions provided by respondents, architects were also asked about their awareness of specific integrated design techniques and whether they had used each technique just once, occasionally, often, or almost always. Results are presented in Table 16.

Table 16.: Familiarity With and Use of Integrated Design Techniques

Design Technique	Aware	Used Once	Use Often or More	% Aware Who Do Not Use Often
Analyze the local climate and its effect on the building to consider it as a resource for light, ventilation, heating and cooling	97%	1%	82%	14%
Shape and orient buildings to use site and climate resources for heating, cooling, and lighting	99%	1%	75%	24%
Windows with lower u value than required by code	98%	2%	65%	33%
Select equipment more efficient than required by code.	99%	2%	62%	37%
Analyze ways to reduce load when deciding on building form, organization, and envelope and the selection of materials	95%	3%	57%	38%
Specify different thermal and visual criteria for ambient and task areas	94%	3%	54%	40%
Analyze owner and user needs and creatively consider adjusting schedules and comfort criteria in establishing design parameters	86%	4%	44%	43%
Occupancy sensors and controls	95%	6%	52%	43%
Displacement ventilation	55%	4%	5%	50%
Use natural ventilation schemes to reduce fan and cooling loads	99%	4%	45%	54%
Third party commissioning	76%	1%	21%	56%
Commissioning	81%	3%	23%	59%
Life Cycle cost analysis	97%	3%	35%	61%
Size HVAC and lighting systems based upon the actual schedule and loads rather than just prescriptive design conditions.	95%	7%	31%	64%
Use daylighting, with automatic controls to reduce lighting loads	98%	7%	31%	67%
Energy performance modeling in later phases of design	85%	5%	16%	68%
Night flushing of thermal mass	79%	3%	9%	70%
Airflow modeling either computational fluid dynamics (CFD) or bulk flow	77%	2%	6%	71%
Radiant cooling	82%	3%	9%	73%
Energy performance modeling in Schematic Design	93%	8%	19%	74%
Underfloor air distribution	91%	4%	8%	82%

Perhaps the most striking overall result is the high level of awareness of these techniques, with more than 75% of architects aware of all but displacement ventilation, and more than 90% aware of 13 of the 21 techniques they were asked about.

The percentage of architects who report using many of these techniques often or almost always is

also relatively high, but may be explained in some cases by the fact that architects say they consider or recommend these measures, not that the owner actually accepts them for the final design. This is particularly true for techniques that ask whether the architect considered or analyzed a certain factor in the design process. One respondent noted, for example, that his "always" answers indicated that his firm always considered them and brought them to the owner's attention; he could not say if the final design always incorporated all these aspects. In addition, these survey results are subject to the usual caveat regarding self-reported data on whether a respondent knows about or takes socially desirable actions.

The third column of Table 16 shows the difference between the percentage of architects aware of a technique and the percentage who say they use it often or almost always; as such it suggests techniques that are either newer to the design of commercial buildings -- such as underfloor air distribution, radiant cooling, airflow modeling, displacement ventilation and night flushing of thermal mass – or that have been available for some time but appear to face significant barriers to adoption – such as daylighting with automatic controls, third party commissioning, sizing HVAC and lighting based on actual loads rather than prescriptive design conditions, energy performance modeling, and life cycle cost analysis. Both these groups of measures appear to be appropriate targets for further development and testing through BetterBricks, and are currently being promoted through the IDLs.

One of the forces helping to support the growing interest in integrated design is LEED. As noted in the market characterization, LEED is increasingly focused on energy efficiency as well as overall sustainability, and has built a significant presence in the PNW and nationally. Of the 97 architects responding to the survey, 31, or almost one-third, reported being LEED accredited. These architects reported working on a total of 102 LEED certified buildings in 2006 and 2007. In addition, non-LEED-accredited architects reported having worked on a total of 48 LEED buildings over the same period.

Because one of the goals of BetterBricks is to encourage architectural firms to actively promote energy efficient design to their clients, we conducted a review of the websites of all the firms where responding architects worked to determine the extent to which sustainable design, green building, integrated design, energy efficiency, and LEED were used in their internet marketing. Our review also looked for mentions of integrated design at each level of the website, but we found no mentions of integrated design at any level.

It appears that sustainable design and LEED are the aspects of efficient design most commonly used for online marketing. The term "sustainable design" was mentioned in home page text on 10% of websites, had a separate button or tab on one-sixth of websites, was defined or discussed on 15% of websites, and had a separate button or tab on 13% of second level pages, such as Who We Are or What We Do. Almost one-fourth of websites mentioned the firms' LEED accredited professionals, and one-sixth of websites listed them by name. In addition, 9% offered examples of LEED projects, 4% offered a discussion or definition of LEED buildings, and 4% had a separate tab for LEED on a second level page. High performance and green buildings were mentioned much less frequently.

Architects were also asked about their own interest in sustainable design, the interest of their firm, and the extent to which they had an opportunity to work on projects that incorporate

sustainable design. Results are shown in Table 17.

Table 17.: Architect Interest in Sustainable Design

Question	All	WA	OR	ID & MT
On a scale of 1 to 5, where 1 is not at all interested and 5 is very interested, how would you rate yourself in terms of your interest in the sustainable buildings movement?	4.6	4.5	4.7	4.5
On that same scale, how would you rate your firm in terms of your firm's interest in the sustainable buildings movement?	4.1	4.0	4.2	4.2
Where 1 is never and 5 is all the time, how often have you had opportunities to work on sustainable building projects?	2.8	2.8	2.7	2.8

The results show a high level of interest in sustainable design both among the architects themselves and among the firms who employ them. In Oregon, for example, all but 2 of the 35 architects rated their interest in sustainable design a 4 or a 5, while architects in all states gave their own firms an average rating of 4.0 or higher.

Compared to both the previous architect baseline survey conducted in 2004 and to the engineer baseline survey conducted in 2006, the individual and firm levels of interest in sustainable design are higher, with the percentage of architects offering 4 or 5 responses for their own level of interest increasing from 79% of architects in 2004 to 91% in 2007. Similarly, the percentage of architects who gave a 4 or 5 rating to how frequently they had an opportunity to work on sustainable projects increased from 20% to 32%, although a gap remains between the level of interest and opportunities to work on sustainable building projects. The relatively low perceived opportunities to work on sustainable building projects appears to conflict both with the 62% of respondents who reported working on at least one LEED building in 2006-2007 and with the high percentage of architects who report using many key integrated design techniques more than occasionally.

External Influences and Barriers

To assess the effects of external influences and barriers, architects were asked about their awareness of BetterBricks, their perceptions of market barriers to energy efficiency, and the impact of such forces as the 2030 Initiative, higher energy prices, owner demand for green buildings, and more stringent codes and standards.

Respondents were first asked about their awareness and use of various aspects of the BetterBricks initiative. If they had used one of these aspects of BetterBricks, architects were asked to rate its perceived usefulness on a 1 to 5 scale. Results are presented in Table 18.

Table 18.: Architect Awareness and Use of BetterBricks

Architects	% Aware	% Used	Usefulness Rating	N for rating
Integrated/Lighting Design Lab	84%	41%	4.1	41
BetterBricks Education and Training	72%	30%	4.4	28
BetterBricks Technical Assistance	64%	21%	4.1	19
BetterBricks Website	75%	50%	3.6	45

Awareness of all aspects of the BetterBricks initiative exceeds 60% among PNW architects, with more than 80% aware of the Integrated Design Labs and more than 75% aware of the BetterBricks website. About half of architects said they had used the BetterBricks website. The IDLs and BetterBricks Education and Training all received high usefulness ratings greater than 4.0, while the BetterBricks website received a 3.6 rating (compared to a 2.8 mean rating assigned in a previous survey by design engineers who had used the website.)

Respondents were also asked to name what they see as the three most significant barriers to energy efficient design. Results, shown in Table 19, confirm that that cost is overwhelmingly seen as the most important barrier, both because of the added cost of more efficient equipment and because of the extra design and analysis cost.

Table 19.: Barriers to Energy Efficient Design

Barrier	% of respondents mentioning
Added equipment cost	78%
Extra design/analysis cost	41%
Energy efficiency not an owner priority	33%
Builder/contractor resistance	14%
Lack of mechanical contractor knowledge	12%
Availability of efficient equipment/materials	11%

One respondent noted that construction cost estimates are often needlessly raised for energy efficient designs. “Contractors tend to bump up their costs when you tell them what you’re trying to do, even if the costs aren’t always higher.” This suggests a need for significant education targeted to the overall construction community, particularly since a premise of integrated design is that dramatic energy savings can be achieved without an increase in upfront cost.

When asked which barriers had declined over the past several years, respondents typically mentioned reduced resistance to energy efficiency and sustainable buildings among owners. One architect said that “there’s been better information and opportunities to at least consider, if not work in those directions.” Another respondent acknowledged that “even with a keener awareness of energy issues, it will still be cost that will be the driving force.”

The importance of economics was also highlighted by architects’ perceptions of how various trends, including energy prices, are likely to influence the design of new buildings in the future. Architects were asked to rate their influence on a 1 to 5 scale, “where 1 means it will not affect

the way you design buildings at all and 5 means it will dramatically change the way you design buildings." Results are shown in Table 20.

Table 20.: Effect of Trends on Design

Trends	Effect on Design Mean Rating
Higher energy prices	3.9
Owner demand for green buildings	3.9
Updated codes with more stringent energy efficiency requirements	3.7
The 2030 Challenge to reduce carbon emissions from new buildings and major renovations to 0 by 2030	3.2
The AIA's goal of a 50 percent reduction in fossil fuel energy consumption for new buildings by 2010	2.8

Higher energy prices, owner demand and more stringent codes are all expected to have a greater impact on architectural design practice than the two AIA initiatives to halve carbon emissions by 2010 and eliminate them by 2030. Those architects who gave high ratings to the 2030 Challenge, however, noted that it "will require radical rethinking of buildings. We need to develop new forms and new materials in response to that goal."

Conclusion

Overall, architects appear to be very aware of and interested in energy efficiency, as indicated by their high level of awareness of integrated design techniques, interest in sustainable design, attainment of efficiency levels 10% above code on more than 30% of projects, use of sustainable design in marketing and participation in whole-team meetings early in the design process on a significant percentage of projects, which offers the potential for integrated design approaches to be discussed but does not guarantee that they will be. On the other hand, use of many advanced design techniques falls far short of the level of awareness, energy efficient design are overruled on up to 26% of projects, and architects generally do not feel they have full opportunities to work on sustainable design projects. Equipment costs, design cost and owner indifference all limit the ability of architects to implement energy efficient design, although the level of interest among clients has been growing. LEED continues to be the focus of many sustainable design efforts, with almost one-third of respondents LEED-accredited, and more than 60% of architects reporting that they worked on at least one LEED building in 2006-07.

6. Utility Survey Results

This chapter presents the Design and Construction related results of a survey conducted to determine the level of awareness of and perceptions about BetterBricks among 31 contacts at utilities and other NEEA funders. Following several questions covering the utilities' energy efficiency priorities and general familiarity with BetterBricks, the survey addressed respondents' perceptions of and experiences with BetterBricks with respect to BetterBricks' five vertical and cross-cutting markets. Complete survey results are presented in a separate report.

DESIGN AND CONSTRUCTION-SPECIFIC RESULTS

When asked whether their utility currently targets commercial new construction in its energy efficiency activities, more than 80% of utility staff said yes. Those who responded yes were then asked what kinds of programs or other activities they were using to target new construction. Respondents offered a number of different approaches or strategies:

- Incentives, including 16 specifically for lighting and 5 for HVAC (29 responses)
- Various forms of design assistance (14 responses, including 2 from EWEB who said they refer customers to the Energy Studies in Building Lab). 11 respondents said their utilities offer both incentives and design assistance.
- Commissioning support (2 responses), efforts to inform design engineers about BPA programs (1 response) and a program where BPA will inform utilities across the region any time a commercial building permit is filed (1 response).

Utility representatives who target commercial new construction were also asked whether they were familiar with the Integrated Design (ID) approach being promoted by BetterBricks.

Table 21.: Familiarity with Integrated Design Approach

How familiar?	Frequency	Valid Percent	Cumulative Percent
Not at all	6	19	19
A little	4	13	32
Moderately	12	39	71
Very	9	29	100
Total	31	100	

About two-thirds of respondents said they were moderately or very familiar with the BetterBricks approach to ID. Moreover, a number of respondents were able to offer definitions that included key aspects of the ID approach (some respondents mentioned multiple features).

- 9 mentioned coordinating the efforts of multiple players
- 9 mentioned a whole building/systems approach
- 8 mentioned involvement early in the design process
- 5 mentioned the need to influence business models/practices

These results suggest that some of the utility representatives have a good understanding of the goals and benefits of ID. To some extent this is not surprising; as noted below, a number of utility representatives interact frequently with the Integrated Design Lab (IDL) network.

Of the 25 respondents with at least some familiarity with ID, 88% said their utility encouraged the ID approach, primarily through design assistance and information (44%), referring customers to the IDLs (24%), offering incentives (20%) and funding charrettes or whole team meetings (7.5%). One respondent commented that a consistent definition of ID would be useful; another said the value of IDL assistance was limited because of relatively slow turnaround on project assistance.

Far fewer (24%, or 6 respondents) said their utility had any activities specifically designed to align with the AIA 2030 Challenge. Two respondents said they were trying to align their incentives with the requirements of the 2030 Challenge, while four said their utility was working on ways to help customers compute or reduce their carbon footprint. Several comments suggest that some utility personnel are not very well informed on issues relating to the 2030 Challenge. One utility rep said that there is a debate out there about carbon issues, so she steers clear of those, while two respondents said that the 2030 Challenge did not affect them because they only deal with electricity – not gas or coal.

Interaction between utility personnel and the IDLs was also compared to their interaction with other BetterBricks market advisors and technical specialists, as discussed below.

Table 22.:Interaction with BB Tech Advisor/Market Specialist/IDL Staff

	No		Yes		Total	
	Count	**%**	**Count**	**%**	**Count**	**%**
Interaction with hospital market specialist?	14	37%	24	63%	38	100%
Interaction with grocery market specialist?	27	71%	11	29%	38	100%
Interaction with IDL staff?	7	23%	24	77%	31	100%
Interaction with building operation tech advisor?	30	81%	7	19%	37	100%

More than two-thirds of respondents had interaction with IDL staff, more than with any other BetterBricks technical advisor or market specialist.

Sixteen utility representatives (80% of respondents) thought coordination with IDL staff was satisfactory or very well done; one of the 20 respondents thought it was very poorly done, and 3 said it could be better. About 74% of utility staff said communication with IDL staff was satisfactory or very well done.

Almost half (46% of respondents) had attended a design charrette or work session, significantly more than had accompanied hospital (17%), grocery (9%) or facility operation (29%) technical advisors. This is probably because charrettes tend to be more frequently held, involve more people, and directly affect utility involvement in the effects of subsequent design decisions.

In conclusion, results of the utility survey show that new construction remains a prominent part of utility energy efficiency initiatives. The IDLs appear to be integral to the design assistance offered by some of the utilities, and communication between utility personnel and the IDLs is generally good. While a significant percentage of utility representatives show a good understanding of the key aspects of ID, others do not distinguish ID from general energy efficiency initiatives. There is currently very little coordination with the AIA 2030 Challenge, although a few utilities are working to establish links between their program offerings and 2030. Providing additional information on the 2030 Challenge to the utilities should be a high priority for the AIA and BetterBricks, particularly if BetterBricks more closely aligns its Design and Construction objectives with those of the AIA initiatives.

7. Assessment of Accomplishments

While there is significant activity outside the Firm Focus aspect of the D&C initiative, it is primarily through FF that BetterBricks hopes to affect major changes in the market. The primary measure of accomplishment in moving toward the long-term goals and 2010 objectives approved by the Board in July 2005 is the extent to which the Firm Focus strategy is working. Column 2 of Table 2 in Chapter 1 describes the expected outputs that should occur if the FF initiative is implemented according to plan to help move the market toward the more specific short-term goals shown in Column 3 of Table 2.

As suggested by the results of the data collection activities for this evaluation, the D&C initiative is making significant progress toward the objectives set out for 2010. Compared to 2006, the Initiative also appears to have a much more consistent approach and an increase in shared assumptions among the players trying to move the market forward.

The most obvious accomplishment is progress with the Firm Focus firms, both in terms of bringing on new firms and in more fully engaging those firms that signed on last year. A comparison of the status of the FF effort in 2006 and 2007 is shown in Table 23.

Table 23.: Firm Focus Status

	Firm Focus Status	
Five Levels of Engagement:	May 2006	November 2007
•*Aware* – Aware of the opportunity to improve energy related business practices	Firms A, B, C	
•*Engaged* – Developing a plan to address these practices		
•*Committed* – The plan has top management support and resources have been committed to implement the plan		Firms D and E
•*Practicing* – The plan is being implemented, with corresponding changes in policies, practices and energy use		Firms A, B, C
•*Sustaining* – Continuous energy management improvement		

As shown in the table, five firms are Committed or Practicing, representing over 50% of the healthcare market and over 40% of the office real estate market. More specifically, the FF firms are engaged with the adoption of the ID process as promoted by BetterBricks in a number of ways. As shown in Table 24, several of the FF firms are making ID an integral part of their business, and have changed their business practices as a result. The two firms that have signed on more recently are both very enthusiastic about their commitment to ID, and are eagerly looking

for input on all level shown in the table.

Table 24.: Firm Focus Involvement

	Firm A	Firm B	Firm C	Firm D	Firm E
Business Practices	X		X		X
Marketing	X	X	X		
P & S Development	X	X	X	X	
Staff Development	X		X		
Technical Assistance	X	X	X	X	X

Specific energy saving features incorporated into designs as a result of the FF initiative have been difficult to document. Several projects that have come to completion using the ID process have achieved dramatic savings (e.g., the Mount Angel Abbey, as described in the case study for that project) but the design work on those preceded the FF relationship. What is clear is that a whole range of fundamental design changes are made possible by adoption of a holistic integrated approach where all members of the design team collaborate from the very beginning of the design process. Firm A's commitment to pursue such an approach on, for example, the new Oregon State Psychiatric Hospital puts a number of design options on the table that would otherwise not be possible. Similarly, the Sustainable Design Group at Firm B is currently working on a master plan for a hospital campus; by incorporating local and even micro-climate data into the master plan now, they make it possible for designers of future projects there to site buildings in a way that will facilitate large reductions in energy usage.

While the provision of research and design assistance on a number of projects appears to be having the effect of providing staff development through hands-on education for the designers who are directly involved, dissemination of that learning through the organization has been lacking. The in-house seminars etc. that are supposed to spread the word through the organization have not even started yet, although individuals at the FF firms are eager to have them available. Particularly at the larger firms where younger architects may have less direct interaction with FF projects, there is likely to be strong interest in Brown Bag and other seminars, since it is often the younger designers within these firms who push for a greater commitment to sustainability.

As noted in Table 8 in Section 4, The IDLs also continue to provide assistance on numerous non-FF projects. For the Boise, Spokane and (until recently) Bozeman IDLs, all the projects mentioned fall outside the FF initiative. For both the Puget Sound IDL and the Oregon ESBL, K-12 school projects continue to receive assistance even when designed by non-FF firms. In addition, both labs are pursuing a number of non-FF projects in the office building, university, and healthcare sectors.

8. Conclusions and Recommendations

The Northwest Energy Efficiency Alliance's BetterBricks Design and Construction Initiative was launched in January 2006. After nearly two years, the initiative is still in the early stages of achieving the objectives set out for 2010, which include incorporating low-energy, integrated design solutions in:

- 25% of projects within hospitals and healthcare;
- 17% of projects within targeted (regional) groceries;
- 15% of projects within targeted (revenue producing) real estate office buildings;
- 5% of projects within other vertical markets.

In 2007, the Integrated Design Labs (IDLs) assisted on dozens of projects with architecture firms throughout the region, a curriculum for presenting ID was finalized, Firm Focus agreements were implemented with three firms and signed with two more, and both the BetterBricks Business Advisors and IDLs continued to offer assistance to the FF firms.

Compared to last year, the Design and Construction Initiative in late 2007 appears to be better coordinated, more focused and gaining momentum. Definition issues surrounding the term 'integrated design' have been worked out and there is a consistent story of what ID is and how it can benefit designers as well as owners. While the IDLs still have their own approaches, the architecture firms that work with them seem to recognize their individual styles and readily adapt to them. Two of the first three FF firms have embraced both the input of the business advisor and the design assistance of the labs, while the third one has rejected strategic input from the business advisor but is actively pursuing ID on a number of projects and has committed to the 2030 Challenge and its 2010 counterpart. The two new FF firms both say they are very excited about the prospect of working with the IDLs and have been receptive to early input from the Business Advisor. In addition, as discussed below, there is a groundswell of awareness of and interest in sustainable design both nationally and through much of the PNW.

Potential challenges to the Initiative's ability to achieve its goals include resource constraints at several IDLs, with projects having to be turned away; the likelihood that FF firms will not be fully transformed and able to go it alone after the initial three-year agreement; and the limited availability of private sector ID resources. Delays in in-house training to disseminate knowledge about ID throughout the FF firms are also a source of concern.

Conclusion 1: It is enviable for a program to have to deal with externally generated interest in the very thing it is trying to promote, and that is the situation for BetterBricks. As detailed in the market characterization section, results of interviews with the IDLs and FF firms, and the survey of architects and utilities, there is unprecedented interest in carbon reduction, green building, and sustainable design, leading to broad market interest in creating a dramatically different approach to the established practice of designing and constructing buildings.

Fortunately, this interest comes at a time when much of the infrastructure for promoting ID is in place. Firm Focus agreements have been signed, the IDLs have developed or have access to modeling and engineering capability, and a common terminology has been settled on for the

promotion of ID so that interest in sustainable design can translate into involvement with BetterBricks. It appears, for example, that the FF relationship with Firm D is a direct result of interest within the firm that grew out of the 2030 Challenge and other external forces, and it was fortunate that the Puget Sound lab had the capacity to take on this new FF partner.

Recommendation 1: BetterBricks should look for other opportunities to take advantage of this interest, including the following:

- More closely align BetterBricks goals with the highly visible market trends discussed above. Expressing Design and Construction targets in terms of greenhouse gas reductions or percentage of progress towards zero net energy as well as energy savings can help the target market see the link between BetterBricks and these broad, well known goals.

- Consider providing technical assistance specifically for the mechanics of tracking progress toward the 2010 initiative and the 2030 Challenge. It is clear that firms who make the commitment have only limited notions of what will be required to attain them. Providing specific assistance on, for example, benchmarking building performance to CBECS, would help all the architects who have committed to these goals develop a more realistic approach to attaining them.

- Take the utmost advantage of the commitments that have been made – whether to the 2010 initiative, the 2030 challenge, LEED certification or accreditation, or other well defined goals by providing as much visibility and publicity as possible to design firms, owners, developers, government agencies and other organizations who make such a commitment. This would reward that commitment and help ensure that those firms and organizations continue to pursue it. For example, BetterBricks could issue a quarterly report of LEED buildings and commitments to the 2030 Challenge announced by PNW architects, owners, or government agencies.

Conclusion 2: While the provision of research and design assistance on a number of firm focus projects appears to be providing staff development through hands-on education for the designers who are directly involved, dissemination of that learning through the organizations has been lacking in the larger firms. There have been very few if any internal training sessions of the kind that are expected to help disseminate knowledge regarding ID techniques throughout the FF organization when many architects are not directly involved on ID projects. Since three of these firms are almost through their second year as FF partners, it is a high priority to begin in-house training activities.

Recommendation 2: BetterBricks should quickly and actively pursue the presentation of curricula on both the technical and business aspects of ID within the FF firms.

Conclusion 3: The Eugene/Portland, Seattle, and Boise labs are working at capacity and, with the addition of a new FF partner, it is likely that Bozeman will be too. The Spokane IDL, however, remains underutilized.

Recommendation 3: Just as a FF relationship is creating a stream of projects for

Bozeman, a similar arrangement might bring the Spokane lab nearer to its capacity. While there is no firm comparable to Firm E in Eastern Washington, there may be smaller but otherwise qualified architecture firms in the region that could benefit from a "FF-lite" relationship. If a review of local architecture firms identifies some potential candidates, BetterBricks could consider a competitive solicitation for a FF partner for the Spokane lab.

Conclusion 4: Although it has no FF relationships, the Boise lab has been very active in reaching out to the design community, developing case studies, organizing training presentations, and working to build modeling and other ID capability locally. Even without a FF relationship, it should be possible for the Boise Lab to provide some of the valued and valuable assistance on the marketing and business aspects of ID.

Recommendation 4: Provide the Boise IDL with at least limited access to the services of the Business Advisor to support the development of business and marketing skills among local architects who have shown capability in the technical aspects of ID.

Conclusion 5: In part because of the time involved in getting the full BetterBricks Design and Construction initiative in place, it seems unlikely that any of the first three FF firms will be sufficiently transformed at the end of the initial three year contract to effectively pursue ID without outside assistance.

Recommendation 5: For each of the FF firms, a strategy should be developed to ensure a smooth transition out of the FF relationship. For example, Firm A is the farthest along in transforming its business and design practices, and it might be appropriate to extend the initial three-year contract with one additional year of reduced support to ease the transition. For Firm C, a similar process might happen a year later. For all the firms, BetterBricks should consider the likelihood that gains can be maintained once support is taken away.

Conclusion 6: In line with Conclusion 5 above, one of the assumptions in the theory behind the D&C Initiative is that the necessary methods and products to design energy efficient buildings will be available in the marketplace, and not just from the IDLs. So far, however, the market is generally not offering the services provided by the labs. There are instances of energy modeling being offered, but such services as daylighting analysis using physical models appears to be available only through the IDLs. In the last MPER we noted that this was not an immediate issue; however, as the FF contracts enter their third year, it will become more pressing as the existing FF firms prepare to transition out of the special relationship they have enjoyed with BetterBricks and the labs. In those circumstances, even a firm committed to following its new business practices may be hard pressed to maintain them if there are no sources of the support it needs to pursue the ID approach.

Recommendation 6: BetterBricks should conduct a systematic analysis of the services needed to support ID and the availability of those services around the region, so that planning can begin for the time when some of the FF firms transition out of that relationship. It may be that the transformed, ID-focused design and construction market represented by FF alumni will include a permanent role for university-affiliated labs that

continue to advance the state of the art of design. Once this analysis is done, the logic model should be updated to represent the new program thinking.

Conclusion 7: There is currently very little coordination between utilities and the AIA 2030 Challenge, and a number of utility representatives showed little awareness or understanding of the AIA initiative, with several believing it was concerned only with gas or coal.

> **Recommendation 7:** Providing additional information on the 2030 Challenge and the link between energy efficiency and carbon reduction to the utilities should be a high priority for the AIA and BetterBricks, particularly if BetterBricks more closely aligns its Design and Construction objectives with those of the AIA initiatives.

Conclusion 8: While survey results show architects to be very aware of and interested in energy efficiency, use of many advanced design techniques falls far short of the level of awareness, energy efficient design are overruled on up to 26% of projects, and architects generally do not feel they have full opportunities to work on sustainable design projects.

> **Recommendation 8:** BetterBricks Education and Training for architects should place a special focus on showing designers how to implement some the more advanced techniques and on how to market ID to owners.

Conclusion 9: Despite having failed to incorporate ID into a strategic plan, Firm B is clearly pursuing ID by working with both the Portland and Puget Sound labs and utilizing the services of the BetterBricks marketing team to develop marketing materials, prepare case studies and pursue speaking engagements. The question is whether this is in keeping with the terms of the original FF agreement, and whether BB should continue to provide Firm B with access to the services of the ESBL and the Puget Sound IDL.

> **Recommendation 8:** In light of the size of the firm and the opportunity for BetterBricks to influence a major player with market influence, we believe the FF relationship should be maintained.

APPENDIX A

Architect Baseline Survey – Final 8-30-07

I. INTRODUCTION/SCREENING QUESTIONS

Hi, my name is __ calling on behalf of BetterBricks, the commercial initiative of the Northwest Energy Efficiency Alliance. I am not selling anything. We are talking to architects who design commercial and institutional buildings in the Pacific Northwest. I would like to talk to (IF CONTACT NAME KNOWN: [Name]) (IF CONTACT NAME NOT KNOWN FOR 1-3 PERSON FIRMS: the person at this firm who is most familiar with your business in the commercial and institutional markets, such as an owner, principal or senior manager. Who would that be?

Name:

Title:

Phone:

WHEN GET CORRECT PERSON Hi, my name is __ calling on behalf of BetterBricks, the commercial initiative of the Northwest Energy Efficiency Alliance. I am not selling anything. I'm doing a survey on design practices, and I am talking to architects to better understand the way in which commercial and institutional buildings in the Pacific Northwest are designed. Your participation in this study is very important, and the results of this research will be used by the Northwest Energy Efficiency Alliance (NEEA) to improve its Better Bricks Program. The results will be incorporated into a report that will be available on the BetterBricks website, probably by the end of the year. All information you give us will remain confidential.

Can you confirm that you are involved in the design of new commercial and institutional buildings? IF NOT, IS THERE SOMEONE AT YOUR FIRM WHO IS INVOLVED IN DESIGNING COMMERCIAL BUILDINGS? THANK AND TERMINATE.

Our conversation should only take about 20 minutes. Is now a good time? [IF YES, CONTINUE. IF NO:] What would be a good time to get together? Appointment date, time:

I'd like to start with a few questions about your design work. In answering these questions, please consider all of the projects you worked on in the four states of the Pacific Northwest (Washington, Oregon, Idaho, Montana).

1. First, what is your title?

2. For classification purposes, how many years have you been a practicing architect?

3. About how many new or renovated commercial and institutional buildings in the Pacific Northwest have you been personally involved in designing since the beginning of 2006 (including those you are working on now)?

4. And how many square feet did those new or renovated buildings represent?

IF LESS THAN 3 BUILDINGS AND LESS THAN 50,000 SQUARE FEET, THANK AND TERMINATE: Thank you very much for your time, but we are talking to architects who have designed at least 3 new commercial buildings or a total of 50,000 square feet in the Pacific Northwest.

5. Thinking only about those projects in the Pacific Northwest that you were involved in since the beginning of 2006, I'm going to ask you to give me your best estimate of the percentage breakdown of that square footage for several criteria:
   - Buildings located in each of the 4 states:
     i. Washington
     ii. Oregon
     iii. Idaho
     iv. Montana
   - By sector
     i. Hospital/medical
     ii. grocery stores
     iii. other retail
     iv. office buildings
     v. K-12 schools
     vi. Colleges and universities
     vii. Other 1 (specify)
     viii. Other 2 (specify)
   - By types of projects (if totals not 100%, explain)
     i. Owner occupied vs. developer-built
     ii. Design-build vs. design-bid-build
     iii. Open end if owner occupied % plus developer-built % not = 100%
     iv. Open end if design-build % plus design-bid-build % not = 100%
   -

II. NATURE, SIZE OF FIRM

Next I have a couple of questions about your firm.

1. How many employees are in your **office**? And how many of those are architects?

2. About how many architects at offices in the other three states of the Pacific Northwest (Washington, Oregon, Idaho, Montana)?

III. TEAM INVOLVEMENT IN DESIGN PROCESS

Next I would like to talk about the interaction between you and other members of the design and construction team during the design and construction process. I'd like you to think specifically about the process for commercial and institutional buildings that are at least 20,000 square feet, plus all K-12 schools, regardless of size.

For all of my questions, please keep in mind that I want you to be thinking of work you have personally been involved in since the beginning of 2006, in the four states. Whenever I ask about floor area, please answer in terms of the percentage of square feet.

1. First of all, what percentage of the floor area of your projects in the Pacific Northwest was accounted for by projects that met the above criteria (i.e., at least 20,000 square feet plus any K-12 schools less than 20,000 square feet)

2. For any projects you worked on in 2006 and 2007, did you ever participate in project meetings where all or most of the members of the project design and construction team were present to discuss project design? (By 'all members' I mean at a minimum the owner/developer, engineers, HVAC and lighting designers, and yourself, including both in-firm staff and external consultants.) (IF NO, SKIP TO 5, IF NO, CODE AS DK)

3. IF YES: What percentage of the total floor area you worked on in 2006 and 2007 was associated with projects where you participated in meetings with all or most of the project design team?

4. I'd like to know at what stages of the process you had these meetings with all or most members of the design team. As I read each stage, please say whether such meetings were held at that stage of the process
    a. Programming
    b. Conceptual design
    c. Schematic development
    d. Design development
    e. Construction drawings and specification
    f. Bidding and bid review
    g. Construction
    h. Occupancy

Next I have some questions about programming and conceptual design activities:

5. What percentage of the floor area of your 2006 and 2007 projects had a client who made energy efficiency (in excess of code requirements) a priority? *(If asked, clarify: By priority, I mean they either requested it at the beginning of a project or they emphatically agreed when*

you mentioned it and were willing to both consider the energy-use implications of different designs and to make some investment in energy-efficiency elements.)

6. Along those same lines, thinking about the projects you worked on in 2006 and 2007, for what percentage of floor area did activities include setting specific or quantitative energy efficiency goals or performance benchmarks other than meeting code?

7. What percentage of floor area was designed to be at least 10% more energy efficient than required by code?

8. (IF ABOVE IS >0%) And what percentage of floor area was designed to be at least 25% more energy efficient than required by code?

Now thinking about the post-design phase of projects you have worked on and how they were actually built...

9. On what percent of projects you worked on in 2006 and 2007 were aspects your energy-efficiency related design decisions or specifications overruled or dropped by owner or contractor decisions?

10. What were the reasons for your designs being overruled? (do not read, check all that apply)
    a. the belief that a less costly approach would work as well
    b. difficulty obtaining specified materials or equipment
    c. concerns that the design idea would cause occupant complaints
    d. owner/contractor did not understand the concept
    e. other (specify)

IV. AWARENESS OF ENERGY EFFICIENT DESIGN ELEMENTS

Next I would like to ask you about your firm's awareness of and interest in a number of techniques and trends related to designing high performance buildings.

1. Are you familiar with the concept of Integrated Design?

2. IF YES, Please tell me briefly in your own words how you would define Integrated Design. Enter verbatim:

3. And what would you perceive to be the benefits, if any, of Integrated Design to the project's owner? Enter verbatim:

4. Let's discuss some specific strategies and approaches to design. For each of the following, please tell me whether you are familiar with the design strategy, whether you have worked with it on projects you have designed, and whether you have worked with it just once, occasionally, often, or almost always.

	Aware	Have used	Frequency
▪ Analyze the local climate and its effect on the building to consider it as a resource for light, ventilation, heating and cooling			
▪ Shape and orient buildings to use site and climate resources for heating, cooling, and lighting			
▪ Analyze owner and user needs and creatively consider adjusting schedules and comfort criteria in establishing design parameters			
▪ Specify different thermal and visual criteria for ambient and task areas			
▪ Analyze ways to reduce load when deciding on building form, organization, and envelope and the selection of materials			
▪ Use daylighting, with automatic controls to reduce lighting loads			
▪ Use natural ventilation schemes to reduce fan and cooling loads			
▪ Choose and size HVAC and lighting systems based upon the actual schedule and the severity of actual loads rather than just peak (or prescriptive) design conditions.			
▪ Select equipment more efficient than required by code.			

5. Along those same lines, I'd like to ask you about some advanced methods and technologies that you may have used. For each of the following, please tell me whether you are familiar with the technique, whether you have worked with it on projects you have designed, and whether you have worked with it just once, occasionally, often, or almost always..

	Aware	Have used	Frequency
▪ Energy performance modeling in Schematic Design			
▪ Energy performance modeling in later phases of design			
▪ Airflow modeling [either computational fluid dynamics (CFD) or bulk flow]			
▪ Life Cycle **cost** analysis			
▪ Underfloor air distribution			
▪ Displacement ventilation			
▪ Radiant cooling			

- Night flushing of thermal mass
- Windows with lower u value (higher efficiency) than required by code
- Occupancy sensors and controls
- Commissioning
- Third party commissioning

6. How many times in 2006 and 2007 have you attended a design charrette that devoted at least an hour to the energy aspects of a building design? (A charrette is a design group meeting to develop new ideas for a project.)

7. Are you LEED accredited?

8. How many LEED certified buildings have you worked on during 2006 and 2007? (Include those currently being designed to LEED standards.)

V. ATTITUDES AND BARRIERS TO ENERGY EFFICIENT DESIGN

1. On a scale of 1 to 5, where 1 is not at all interested and 5 is very interested, how would you rank yourself in terms of your interest in the sustainable buildings movement?

2. On a scale of 1 to 5, how would you rate your firm in terms of your firm's interest in the sustainable buildings movement?

3. On a scale of 1 to 5, where 1 is never and 5 is all the time, how often you had opportunities to work on sustainable building projects?

4. I would also like to ask you about barriers that may make it more difficult to design high performance buildings. Please tell me what you see as the three most important barriers to more energy efficient design (DO NOT READ; CHECK ALL THAT APPLY).
    a. added equipment/materials cost
    b. extra design/analysis cost
    c. lack of access to analysis tools
    d. specified equipment is not available
    e. not enough time in project timeline
    f. lack of mechanical contractor knowledge
    g. it is difficult to find information on energy efficient designs
    h. energy efficiency is not an owner priority
    i. occupant comfort requirements are too difficult to achieve
    j. Other 1 (enter verbatim)
    k. Other 2 (enter verbatim)

5. Which of these barriers, if any, would you say have been reduced over the past two years?

VI. INFORMATION SOURCES, INDUSTRY TRENDS

I have just a few more questions. Now I would like to go over some sources of information and assistance that you may have used in designing high performance buildings since the beginning of 2006..

1. For each of the following, please tell me whether you have heard of this information source, whether you have used it, and if so, how useful you found it. (For each ask: Are you aware of (X). IF YES, Have you used (X) for information or assistance on energy efficient design? IF YES, How useful did you find this information source, again using a 1 to 5 scale, where 1 means not at all useful and 5 means very useful.)

	Aware	Have used	Rating
a. Integrated design lab at your state University			
b. Better Bricks or Integrated Design Lab training and education			
c. Better Bricks technical assistance			
d. The BetterBricks website			

2. What percentage of the total square footage that you designed in the four states in the PNW in 2006 and 2007 received utility rebates or funding from organizations like the Energy Trust of Oregon or Bonneville Power Administration?

3. (ONLY FOR THOSE WITH PROJECTS IN OREGON) Regarding buildings that you worked on in Oregon, are you aware of the Oregon Business Energy Tax Credit, or BETC (Betsy), for energy efficient new buildings?

4. (IF YES) Did you take the BETC into account in any of the designs you did in Oregon in 2006 and 2007?

5. IF YES: On what percent of the square footage you designed in Oregon?

6. IF YES: Were any of the projects on which you used the BETC <u>not</u> LEED buildings?

7. ALL RESPONDENTS: Now I would like to ask you what you see as the most important trends or pressures facing your industry today, both in the Northwest and nationally. These do not have to be energy-related. We are looking for anything major that is affecting the industry.

8. How do you think those trends will influence the way you design commercial buildings over the next several years? Over the longer term?

9. Finally, I would like to ask you about the importance of some specific trends. For each of the following, please tell me to what extent you think it will affect the way you design buildings over the next 10 years, using a 1 to 5 scale, where 1 means it will not affect the way you design buildings at all and 5 means it will dramatically change the way you design buildings. (For all "4" and "5" responses, follow up with: "How do you think it will change the way you design?")

    a. Higher energy prices
    b. The American Institute of Architects (AIA's) goal of a 50 percent reduction in fossil fuel energy consumption for new buildings—over that of an average building of the same type in the same area—by 2010
    c. Owner demand for "green" buildings
    d. The 2030 Challenge to reduce carbon emissions from new buildings and major renovations to 0 by 2030
    e. Updated building codes with more stringent energy efficiency requirements
    f. Other trends mentioned above

Those are all the questions I have. Thank you very much for your time and your help.