THE HIGH PERFORMANCE PORTFOLIO:

INTEGRATED DESIGN

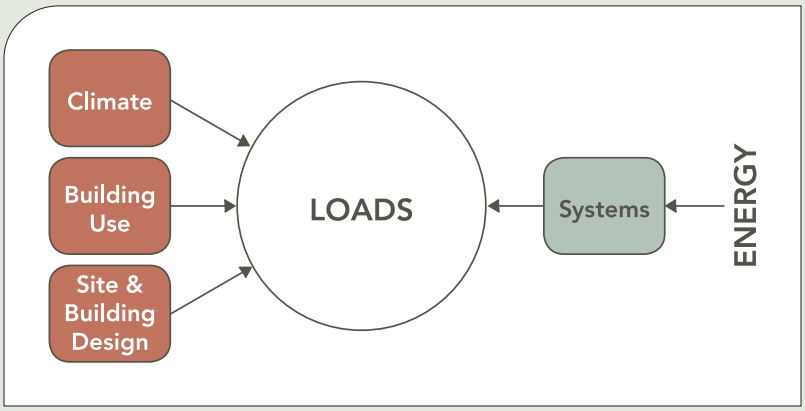
BETTERBRICKS
Bottom line thinking on energy.

SUMMARY:

Traditionally, designing a new building involves linear, sequential steps carried out by owners, architects, engineers, and contractors. Integrated design, however, unites these groups from the beginning. The collaborative integrated design process optimizes interactions among the building's site, climate, structure, landscaping, and systems, creating significant operational and financial efficiencies.

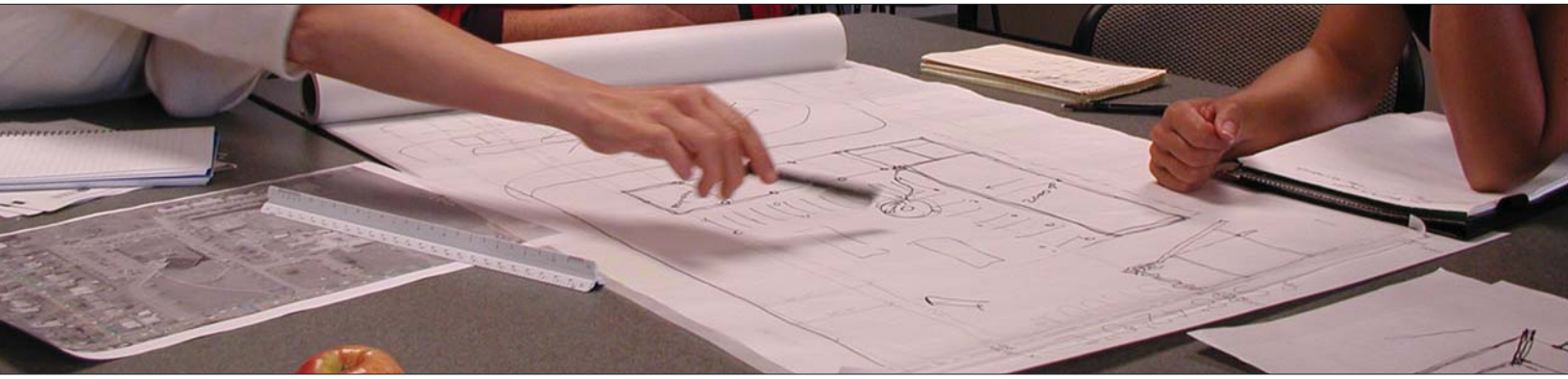
IN DEPTH:

When it comes to energy efficiency, new developments are a clean slate. Unlike most existing properties, a new building is not limited by in-place systems or lease requirements. It may be limited, though, by the traditional design process.



Two balancing forces determine a building's energy use: energy loads driven by the needs of occupants (such as light and heat), and systems that use energy to meet those needs (lighting and air-handlers). In a conventional design process, engineers are handed a fixed set of building characteristics and loads for which they must size and design the building's systems. Under these circumstances, any efficiency improvements must be derived by specifying more efficient – and usually more expensive – equipment.

But by considering the determinants of loads – climate, building use, and building design – early in the process with a focus on creating smaller loads, performance can be significantly improved prior to specifying efficient equipment. Design teams can propose more effective solutions to reduce energy use when they're allowed to explore both minimizing loads and increasing system efficiencies.



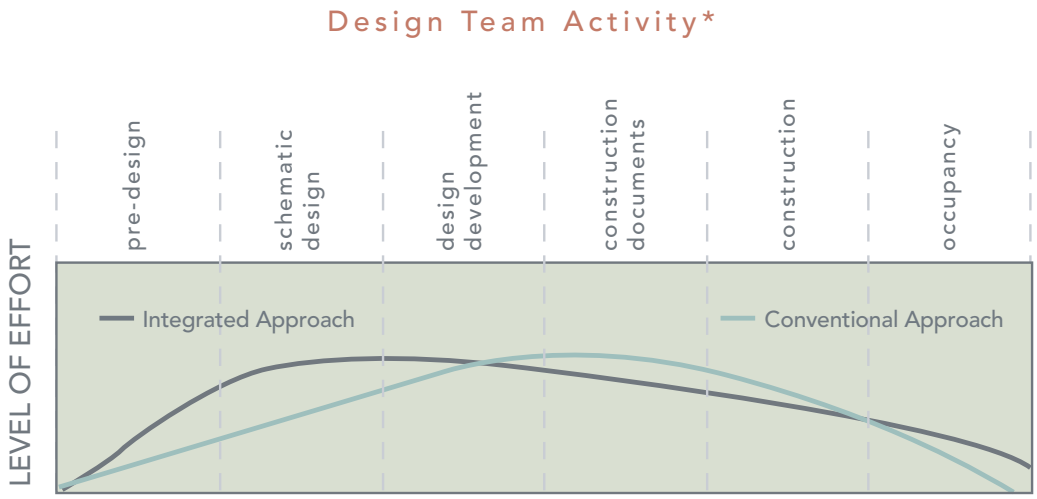
The interplay of these elements is the focus of integrated design. When taking an integrated design approach, the fundamental process is the search for design synergies – opportunities to create a whole greater than the sum of the parts. The result of these opportunities is often energy efficiency gains that wouldn't have been realized independently. For example, harvesting rainwater may reduce pumping costs, saving water and energy, while reducing wear and tear on systems. Optimizing daylight exposure can reduce lighting loads, thus reducing summer cooling needs, further improving energy performance.

BEST PRACTICES FOR INTEGRATED DESIGN

Efforts are underway to standardize the integrated design process, but generally there are a few key steps and considerations to deliver a high performance building through this approach:

PRE-DESIGN

- Ensure all stakeholder groups commit to integrated design principles. You might begin by setting an organization-wide mandate that all new projects must take an integrated design approach.
- Assemble a multi-disciplinary, collaborative design team. Include owners, developers, architects, engineers, contractors, proposed occupants, commissioning agents, O&M staff, and energy or sustainability consultants. To gain confidence that the team has all the necessary skills and to ensure that all members can contribute in the pre-design phase, you'll need to know exactly who they are before you begin.
- Consider whether training, outside consultants, or "on-the-job" learning is required for the team to acquire the technical skills and expertise necessary for successful integrated design.
- Hold an initial planning charrette with all team members to set goals early and clearly identify roles and responsibilities. Use this as an opportunity to gain collaborative agreement on design intent, considering site, climate, architecture, building use, energy, and environmental issues.
- Set an energy performance goal. Revisit your organization's general thresholds specified in your energy management policy, and evaluate their feasibility given the particular circumstances of your project. Examples of performance targets include achieving 40% less energy consumption than ASHRAE standards, or achieving an ENERGY STAR energy performance rating of 85 or higher one year after occupancy.
- Develop a sufficient budget to achieve your performance goals, allowing for additional up-front design costs. Integrated design is more time-intensive early in the process, with less time and funding required during later design and construction stages.
- Set financial criteria for the project. Factor in all available incentive programs, and consider life-cycle costs of building systems and components.



* Curves are conceptual and represent approximate results.
Source: BetterBricks, based on review of literature.

SCHEMATIC DESIGN & DESIGN DEVELOPMENT

- Hold a design charrette to begin to generate cross-disciplinary solutions and strategies, and establish a collaborative working environment among all team members. You might hold charrettes at the beginning of each design phase.
- Assess various high performance design strategies and technologies. Conduct simulations and trade-off analyses in order to understand the potential costs, benefits, design implications, and environmental impacts of each. Pay particular attention to synergies and interactions. Considerations include:
  - Reducing energy loads by optimizing building orientation, landscaping, shading, solar heat gain, daylighting, energy-efficient lights, natural ventilation, and building envelope solutions (e.g., high-performance window glazing, roofing, and insulation)
  - Right-sizing mechanical systems based on anticipated energy loads
  - Reducing water use and the need for excess pumping through water-efficient landscaping and equipment and innovative wastewater technologies
  - Employing advanced technologies such as computerized building controls, advanced Energy Management Systems (EMS), and waste heat recovery systems
  - Generating energy on site after efficiencies are maximized using photovoltaic panels, solar water heating, and diesel and gas generators

- Conduct a whole-building energy analysis and a detailed engineering analysis based on the strategies and technologies you identify. Compare projected results with your energy performance target, and adjust your plans accordingly.
- Conduct detailed systems development and review, with involvement from the commissioning agent and operations staff. The design team must be prepared to work with independent third-party commissioning agents throughout the integrated design process, at multiple touch-points.
- Compile detailed documents explaining systems installation and enhanced operations practices that will sustain maximum building performance over time.

CONSTRUCTION DOCUMENTS & CONSTRUCTION

- Evaluate energy-, cost- and time-saving concepts suggested by all team members, fostering a climate of contribution. Seek and welcome input from a wide array of views, and encourage people to think outside their functional silos.
- By involving all team members from the beginning, integrated design should reduce the risk of change orders. However, if change orders arise, assess their impacts on integration and projected energy performance.
- Calculate the return on investment for any additional costs of high performance components.
- Include the following in construction documents:
  - A statement of energy design intent
  - Energy performance and other specifications
  - Summaries of high performance features and intended functions
  - Methods for holding all parties accountable for achieving performance goals and timetables, and incentives for achieving goals
- Select qualified manufacturers of highly efficient equipment. Educate contractors, engineers, and equipment providers on performance goals.
- Involve the commissioning agent, contractors, and design team in a final review of construction documents.

SUCCESS STORY

Brewery Blocks – 1.7 million SF of office space, retail, and housing in Portland, OR – used integrated design to achieve a high performance project. A design charrette opened avenues for collaboration among the design team, and generated ideas for improving the project's expected performance. The team then developed guiding principles for design and construction, including a focus on life-cycle cost analysis and energy modeling. The result? The high performance strategies that were incorporated provide energy savings of almost 30% over Oregon code. Tenant manuals explaining green features and providing suggestions for efficient operations ensure the integrated design principles carry over to the occupants.

POST-CONSTRUCTION/ OCCUPANCY

- Benchmark energy performance using ENERGY STAR Portfolio Manager, establishing a baseline for monitoring of future performance. One year after the completion of commissioning, or at least 12 months after occupancy, evaluate the results of the integrated design process by reviewing benchmarking results and utility costs. Compare actual energy performance to the design intent.
- Consider administering a tenant survey to determine their satisfaction and concerns.
- Establish an ongoing energy management program, encouraging continual tracking and rating of energy performance.
- Review proposed tenant improvement projects for variations from the original design intent. Ensure that interior fit-outs do not erode performance, but instead sustain or enhance it.

By undertaking these activities, you can achieve a design process with fewer risks associated with change orders and communication breakdowns. You can also achieve a building with enhanced efficiencies, lower risk of system failures, and a better ability to meet occupant needs. Whether the eventual strategy is to hold a property long-term or to seek a buyer, the potential reduction in operating costs – and the Class A designation frequently associated with high performance buildings – will greatly enhance the property's competitiveness.

THE BOTTOM LINE:

- Integrated design differs significantly from traditional development. It typically involves more effort in the early stages of design, but less during later stages including construction, and may require adjustments to contracts and payment schedules.
- Better energy performance can be obtained when designers explore synergies between climate, use, building loads and systems.
- To achieve the best results, stakeholders such as commissioning agents and sustainability consultants may need to be invited into the collaborative design process from the earliest stages.

USEFUL LINKS:

The High Performance Portfolio Framework
www.betterbricks.com/office/framework

BetterBricks Design & Construction Resources:
http://www.betterbricks.com/design

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