

Sustainable Design and Development: An Integrated Design Team

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Green Building is Growing Stronger

Sustainable design and development, more commonly referred to as green building, is more than a fad. The construction industry has embraced the green movement because it makes sense as a means to improving energy conservation, occupant productivity, and public sentiments to enrich our world. Green building has reached its tipping point; the movement that began in the 1960s, and became main stream in the 1990s with the creation of the U.S. Green Building Council, has caught on throughout the construction industry.

The top three nonresidential construction segments in 2008 are projected to be office, education, and health care. Together, these segments will make up over 80 percent of nonresidential green construction. The lodging and commercial segments are also projected to become greener by 20 percent. And while the housing market continues its slump, one bright spot is the expanding use of residential green building techniques and sustainable materials.¹

Sustainability is forcing significant changes within the construction industry. Moving from the planning and design phase, to the construction and completion stages, requires a detailed, well-defined plan. Green building doesn't just happen because of someone's desire to reduce their structure's carbon emissions, or to increase utilization of recycled building materials, it happens when a group of experts come together, establish objectives, and follow a plan using best practices.

Most individuals in the construction industry recognize LEED®, Leadership in Energy and Environmental Design. Its certification program utilizes a rating system to measure the design, construction and operation of high performance green buildings. The well-known certification program awards points in the areas of sustainable site development, water savings, energy efficiency, materials selection and indoor environmental quality. LEED was first introduced by the U.S. Green Building Council in March 2000 and continues to evolve today. The four certification levels, ranging from basic LEED certification to silver, gold, and platinum levels, combine green technologies and practices within an integrated design framework. In addition to sustainability's environmental benefits under the LEED system, its integrated design approach encourages cost-effective practices.

Integrated Design and Development Offers Value

Under the traditional design-bid-build process, a lack of communication sometimes exists between stakeholders. Architects, engineers, contractors, and others often operate as separate entities, interacting mainly during hand-offs to the next phase of construction. With a traditional approach, some would admit that the right-hand can lose sight of what the left-hand is doing—until it is too late. This can drive higher costs, missed deadlines, and a lack of focus.

On the other hand, an integrated design and development mindset is critical to maximizing sustainable

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building success. “Sustainable design must begin at the conceptual stage of a project to realize the full benefits.”² From the start, disparate tasks are weaved together to form sustainable strategies that serve to contain and direct the project team’s decisions, and ultimate achievements.

Design team members are involved at the beginning and throughout the project, resulting in greater integration. “For example, when the contractor has been included in the design phase and understands the goals of the project, challenges and calls for substitutions can be reduced because the overall design strategies will be better understood. When the overall goals are understood, the contractor can often offer creative solutions that will limit environmental impacts during construction.”³

According to Daniel Becker, AIA LEED, senior project manager with Plunkett Raysich Architects, LLP in Milwaukee, Wis., “you get a more holistic approach to the design process with input from a broad range of people.” Supporting the building as a sustainable system requires teamwork between engineers, architects, contractors, and others. Through a highly coordinated effort, the result is a whole structure that operates synergistically, often lowering the first costs and long-term costs for construction, operation, and maintenance.⁴

An integrated design team uses a circular decision-making process as the means to reducing or equaling first costs, as compared to a traditional design process which is linear in nature. Calling upon their sustainability objectives as a guide, and their individual expertise, an integrated design team evaluates the tradeoffs that exist throughout the design and construction initiative. Sometimes increasing costs in one area leads to lower costs down the road, or in another area. The team’s value resides in evaluating these cost tradeoffs against pre-established green goals and reduced operating costs. An optional feature that is more expensive than other alternatives, may lead to significant energy use cost savings, or other benefits such as environmental and social benefits.

With an integrated design team, Becker emphasizes that “you don’t necessarily need to spend more money; it just requires shifting the cost curve back.” In a traditional design process, the majority of time and money is expended about three-quarters of the way through the design process. Shifting the curve ahead to a quarter to half-way through the design process, adds value to sustainable projects. Becker believes this is because detailed decisions are made during the schematic design phase, rather than the construction drawing phase, when they typically do not reap as high a benefit. Bringing all stakeholders together early in the process helps ensure a successful project outcome.

Integration is not only valuable in helping to keep first costs low; it helps ensure the right people are involved to streamline construction processes, and look at overall lifecycle costs. As a building owner or operator, maintenance costs are just as important as construction costs. When the Zion National Park Visitor’s Center was envisioned, the team took a whole building design approach. Looking at the Springdale, Utah facility as one sustainable system, they considered the engineering and building design simultaneously. This helped to ensure the building’s features worked together to achieve sustainability goals.⁵

The integrated design and development team adds value to sustainable development by establishing defined objectives for sustainability, functionality, and performance, while recognizing tradeoffs sometimes are needed, and understanding how their decisions affect first costs and life cycle costs.⁶ A big picture view leads to greater adherence to sustainable outcomes.

Design Team Members Act as One

Commitment, combined with experience, is the primary qualification for sustainable design team members. Due to the high level of collaboration required, team members must be focused on overcoming any obstacle to build consensus for achieving project objectives. Integrated means: “to make into a whole by bringing all parts together; unify.”⁷ It has been demonstrated that undertaking a whole building construction approach is most effective with a whole team approach. Acting as one can be a challenge, as Becker points out. “Many things can influence the design process, so getting (and maintaining) owner commitment to sustainability goals, without deviating for first-cost financial reasons is the biggest challenge.” This can be overcome, according to Becker, by holding a visioning session to establish project mission and vision statements. These sessions are becoming very common on all projects.

Green building continues to evolve as a design-bid-build process, so including innovative team members is paramount. Through their technical and sustainable building experience, team members are the catalysts for developing innovative solutions which meet energy, environmental and social goals within an established budget.

Team building, like green building, starts with forming a team of highly qualified architects, engineers, sustainable design consultants, operations and maintenance staff, contractors, cost consultants, value engineers, occupant representatives, and a commissioning agent to work with the owner.⁸

Team members participate throughout the process, sharing insights and best practices, and aligning decisions with project objectives. For example, the value engineer is responsible for analyzing different systems while keeping an eye on how each decision affects value.⁹ Cost consultants add value to sustainable projects during the planning, design, and construction phases. As an integrated design team member, cost consultants use cost management techniques to balance the project’s scope, quality, and budget throughout the project life cycle.¹⁰

Integrated Design Team members

Integrated design team members may include:

- > Architecture Team
- > Mechanical Engineering Team
- > Commissioning Agent
- > Energy Analysis Consultant
- > Electrical Engineering Team
- > Lighting Designer and/or Daylighting Specialist
- > Plumbing Engineer

- > Structural Engineer
- > Civil Engineer
- > Landscape Architect
- > Interior Designer
- > Specifications Writer
- > Cost Consultant
- > Environmental Consultant
- > Sustainable Design Consultant¹¹

Following this critical first step, the integrated design team needs to focus their attention on goal setting. Armed with their combined expertise, along with LEED and other tools, they'll establish sustainable design goals to serve as a framework for future decision-making.¹² Together the team will work through the construction life cycle, from site evaluation through to post-occupancy needs.

The project leader or “champion” helps the team remain focused on their objectives by providing leadership to the project. This individual must be influential with instituting decisions that are aligned with project objectives, while also ensuring the developer and financier are committed to the process.

The design and building of the EPA Region 8 Headquarters illustrates the integrated design team approach. They established several project teams that regularly communicated and coordinated efforts. The core team included: one entity serving as the developer, contractor, and owner; the design architect serving as the LEED expert; a firm representing daylighting, energy, mechanical, electrical, and plumbing engineers; a structural engineer; a security and blast consultant; and a construction LEED expert who prepares the final LEED documentation for the U.S. Green Building Council. The developer delegated each team member the responsibility of acting as a LEED design consultant, researching and developing sustainable design recommendations. The project team communicated technical information based on cost-benefit analysis, and worked with various federal and local agencies to achieve their objectives.¹³

An Integrated Design Process

During the EPA headquarters project design phase which spanned five years, the integrated design team evaluated the facility's design, construction, and operation based on environmental impact, function, and cost. All decisions were considered with these criteria in mind. According to the EPA Project Manager, the result was a facility that “may not be [environmentally] perfect, but it is a long way from where it would have been and a lot closer to where all buildings should be.”¹⁴

The other main component in whole building design is an integrated team process which relies on the knowledge and skills of all stakeholders, across the design and development life cycle, to understand, evaluate, and apply the interrelationships and interdependencies of all building systems. If followed, a high-performance building should be the result.¹⁵

How do team members get to the end goal? They start with the end in mind by educating stakeholders and setting goals. Education is particularly important when team members have less

experience working on sustainable design projects. Setting goals leads to decision criteria that are called upon throughout the process. Along the way different opportunities and challenges will be presented, but the integrated team will be well-prepared to evaluate the cost and schedule impacts to uphold their sustainability objectives.

The design team for the JohnsonDiversey Global Headquarters in Racine, Wis. faced a tight schedule head-on using this collaborative process. The building was designed and constructed prior to LEED, so the team had to rely on its own research and guidelines. They cite as a key to success the integrated design team process.¹⁶

From setting the team mission and goals, to understanding issues and communicating with stakeholders, the integrated design process addresses the many aspects of whole building design. These include:

- > Sustainability
- > Accessibility
- > Aesthetics
- > Cost-effectiveness
- > Function and operation
- > Historic preservation
- > Productivity
- > Security and safety¹⁷

A couple of tools used to assist with an integrated design approach are the design charrette (the visioning session mentioned previously), and building information modeling software. A design charrette is a brainstorming session that takes place at the beginning of the project as way to share ideas and information. During a charrette, stakeholders and experts address issues large and small. These workshops have been used extensively for integrating sustainability and other whole building design considerations. Depending on complexity, sessions may require only one meeting, or a series of meetings to reach their objectives.

Building information modeling software or BIM creates electronic models which make it easier to evaluate design alternatives, an important variable in considering sustainable design tradeoffs.¹⁸

Steps to Success With Integrated Design

Steps to success with an integrated design process:

1. Create a vision that includes sustainable principles, including integrated design and development.
2. Define a mission, clear goals, design criteria, and project priorities.
3. Include green building within the project budget, planning for contingencies for additional research, if needed.
4. Engage committed design team members that possess green building experience.
5. Include commissioning in the project schedule to help ensure the building's performance meets design and occupant needs.
6. Maintain project oversight.¹⁹

Conclusion

Forming an integrated design and development team at the outset of a sustainable initiative builds a foundation for success. Sustainable projects utilizing a “whole” building approach require a “whole” team. They call for expertise from various disciplines in order to realize the owner’s vision for an environmentally-friendly building.

Sustainable design and development has caught on throughout the industry. It makes sense from a business perspective and affects bottom lines by lowering operational and occupant costs, improving productivity and employee retention. For additional cost management considerations, watch for the final article in this series coming soon.

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Footnotes

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