INTEGRATED DESIGN PROCESS FOR SCHOOLS

"If you can't afford to do it right the first time, how can you afford to do it twice?" – Amory Lovins

An integrated design process is the most cost effective way to achieve a high performing building. It addresses issues early on avoiding missed opportunities for performance and economy.

Integrated design incorporates multi-disciplinary analysis as well as accountability. Ideally, it includes the following steps:

- Design workshop(s) (known as an eco-charrette) where all design disciplines are represented as well as other stakeholders
- Analyses that allow iterations of improvement in the design. Examples would include computer simulations or modeling that would test design concepts (example, energy models)
- Periodic benchmarking against the goals and objectives throughout the design and construction process
- Commissioning to ensure the building has been built to the design intent and thus has true potential for achieving green building and high performance benefits

The decision to use the integrated design process must be made very early on. The more comprehensive the strategy, the earlier it should be considered and adopted. (For example, a strategy like solar power requires a particular location and orientation on the site).

Integrated design is a term that describes the steps above as well as the resulting design. This design fully integrates the architectural, mechanical, electrical and other systems of the building to get the highest performance possible. This approach can lead to significant first cost savings. For example, if the buildings' form and location lends itself to be naturally ventilated, a mechanical cooling system can be downsized, or even eliminated.

Integrated design is not just a one-time activity. The project team needs to periodically reconsider and reinforce sustainable building goals agreed on earlier. Without these periodic meetings it is easy to resort to business-as-usual solutions and let standard solutions replace innovative ones because they are more familiar and comfortable.

The following presentation of an integrated process for achieving significant energy savings in new school buildings is valuable for designers and builders who want to augment and improve their practices so that energy efficiency is deliberately considered at each stage of the development process from project conception through building operation.

LEADING THE INTEGRATED DESIGN PROCESS

It is essential to have a champion from within the school district (i.e. on the "owner's" side) to drive the integrated design process throughout project delivery (i.e. planning, budgeting, design, construction, commissioning and start-up). The champion is usually a high-level construction manager or facility director within the school district, or an owner's representative. The architect serves as leader and coordinator.

The following steps describe key points of involvement for the champion of integrated design. The steps are organized as a checklist for each of the traditional phases of design.

PRE-DESIGN PHASE

- Commit to an Integrated Design process.
- Hold a meeting with planning consultants to identify high performance goals, such as "Use 25% less energy use than required by code" OR "Provide a healthy learning environment."
- Hire design professionals with Integrated Design experience and high performance project examples.
- Assess adequacy of the project budget and schedule, allow for additional time during Schematic Design for Integrated Design.
- Identify roles and responsibilities for team members, including a champion for the Integrated Design process.
- Hold a full design charrette with all design team members and school district project manager, as well as building user representatives from the following: facilities maintenance, teaching staff, parent group, and, if age-appropriate, student body.
- Use existing framework(s) to brainstorm strategies you can use to achieve those goals. Existing frameworks include the Washington Sustainable Schools Protocol, LEED for Schools, Collaborative for High Performance Schools, the New Building Institute's Core Performance Guidelines, and ASHRAE's Advanced Energy Design Guidelines. (See the Tools & Resources section of the betterbricks.com/schools web site.).
- Coordinate this process with the educational specifications. Ensure no conflicts with high performance goals. (Example, solid walls for classrooms provide space for hanging student projects, but may reduce potential for daylighting.)
- Identify the person who will serve as the commissioning authority for the project.
- Determine financial criteria and priorities for design decisions.
- Talk to local utilities, non-profits, state and federal agencies about available incentives and tax credits.
- Ask the design team to gather climate and utility cost data.

SCHEMATIC DESIGN

- Refine the building program and space functions.
- Schedule periodic team meetings and support brainstorming and collaborative problem-solving.
- Encourage the designers and engineers to develop several design options that reduce loads on the building.
- Support simplified energy modeling and Life-Cycle Cost Analysis for design alternatives in order to make objective choices between options.
- Remind the design team to compare results of this phase to the high performance goals.
- Ensure that the commissioning authority works with the owner to document design intent and owner program requirements.
- Complete a preliminary rating/scorecard using the framework applicable to the project. This can be used as a benchmark throughout the project.

DESIGN DEVELOPMENT

- Hold regular team meetings to ensure communication among team members. Ensure high performance design is a regular meeting topic.
- Evaluate various building systems for their possible integrated benefits.
- Request whole-building energy modeling to confirm the preferred design meets the energy performance goals, and to confirm eligibility for rating systems, incentives and tax credits.
- Update rating document/scorecard as part of benchmarking.
- Verify that the design documents at this stage contain the strategies to meet the performance goals.
- Request more detailed cost information from team members to update the schematic phase cost model.
- Work with the value engineer to ensure functional value of high performance features are not overlooked.

CONSTRUCTION DOCUMENTS

- Hold regular team meetings to ensure communication among team members. Ensure high performance design is a regular meeting topic.
- Have the commissioning authority and maintenance and operations personnel perform a document review of building systems.
- Update the cost model and schedule with team input.
- Update rating document/scorecard as part of benchmarking. Request documentation from the team for this purpose.
- Verify that the construction documents contain the strategies to meet the performance goals (consider asking the contractor or the commissioning authority to conduct this review; an alternative is for the "champion" to take this role.)

CONSTRUCTION

- Conduct a construction kick-off meeting with the contractors and subcontractors to secure their commitment to the high performance goals. Point out specific aspects of construction documents that pertain to these goals.
- Ask the architect to carefully review submittals and substitution requests for impact on performance goals.
- At the end of construction and prior to occupancy, allow time for the commissioning authority to complete functional testing and Operations & Maintenance training.
- Review the commissioning report and have the contractor address any recommended repairs or alterations.

OCCUPANCY

- Establish an ongoing energy management program, including training and periodic re-commissioning.
- After the warranty period shakedown, verify that high performance goals were met, assess occupant satisfaction, and share feedback with the whole team.

DEFINITION OF KEY TERMS

PRE-DESIGN (PROGRAMMING): This phase identifies the program needs, assesses the feasibility and confirms the construction requirements for the project. It includes an initial study of site constraints and impacts, site-related design guidelines, diagrammatic floor and stacking plans, a space program, building systems description, a summary schedule and a preliminary budget.

SCHEMATIC DESIGN: This phase is where an interactive process develops and explores a variety of alternatives both at the whole building level and at the component level. The primary objective of this critical phase is to develop a clearly defined design including scale and relationships among the project components. Budget and schedule are also established and the project is submitted for permits.

DESIGN DEVELOPMENT: This phase refines the scope of work started in Schematic Design, further developing the selected option. A clear, coordinated description of all aspects of the project is worked out. The Design Development phase is the last opportunity for significant design input, but any change to scope or program will likely incur budget and schedule impacts.

CHARRETTE: A Charrette is an intense meeting, half a day or more, in which all participants in a building design project creatively focus on strategies for meeting the project's performance goals through efficient use of energy and resources. If not done in an earlier planning meeting, the group also generates specific measurable goals. For a description and sample agenda, see www.BetterBricks.com/schools in the tools and resources section.

COMMISSIONING: "The basic purpose of building Commissioning is to provide documented confirmation that building systems function in compliance with criteria set forth in the Project Documents to satisfy the owner's operational needs." Building Commissioning Association www.bcxa.org

HIGH PERFORMANCE SCHOOL FACILITY: A facility that delivers superior energy, economic, and environmental performance benefiting students, staff, the community and the bottom line. They improve the learning environment and cost much less to operate.

INTEGRATED DESIGN: Integrated Design synthesizes climate, use, loads, and systems, resulting in a more comfortable and productive interior environment and a building that is more energy efficient than current best practice.

LIFE-CYCLE COST ANALYSIS (LCCA): The total cost of owning, operating, maintaining, and (eventually) disposing of the building system(s) over a given study period. In other words, LCCA is a way of assessing the true cost of facility ownership throughout its lifetime.