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The Cost of Green

SEVEN STEPS TO COST-EFFECTIVE HIGH PERFORMANCE DESIGN

By Witmar Abele

In the wake of the report on global warming issued by the Intergovernmental Panel on Climate Change (IPCC) in Paris last February, that sent shockwaves through all levels of government around the world, we can be sure to expect changes in the way public buildings will be required to perform in the future. Given the fact that roughly 40 per cent of all energy is consumed, and as much as 50 per cent of greenhouse gas emissions produced by the offices, hospitals, schools and other buildings we live in, this is low-hanging fruit for governments trying to figure out how they will be able to meet their Kyoto commitments. While many municipalities have already committed to a high level of sustainability in their buildings, other levels of government are now likely to follow suit, with LEED Silver or Gold as the minimum standard for any of their new buildings.



Heritage Woods Secondary School located in Port Moody, B.C., is Canada's first LEED Silver Certified School, becoming the second school in Canada to be officially recognized as achieving a LEED rating. The design team has achieved a high standard of sustainable design by focusing on strategies that would yield the highest return in terms of resource conservation, environmental impact and occupant health and comfort. This 11,770m² school for 1,200 students was completed in 2005 within the Ministry of Education's allowance at a construction cost of \$1,140/m² – a bargain compared to today's rapidly escalating construction costs.

But what is the cost of building green? In the light of finite financial resources, will a number of capital projects be shelved or cancelled as a result of mandating green design?

Sustainably designed buildings consume less energy and less water, utilize materials and resources more efficiently, and generally provide a healthier environment, thereby enhancing the performance and productivity of the people who work there. Green buildings cost less to operate and maintain, and should last longer than regular buildings. So from a School District's perspective green buildings make good sense. The problem is that while funding authorities would do well to build long-term operating costs into project funding formulas, it seems that for now at least there is no mechanism by which to shift money from operating budgets to building budgets.

Consequently lowest first-dollar cost is still the name of the game, and the construction budget generally does not support the features that will result in those long-term savings. Or does it?

While it is generally accepted that buildings designed to a LEED standard will cost anywhere between 1% to as much as 10% more, the good news is that in the hands of an experienced and skillful design team it is possible to achieve a high level of green design (up to LEED Silver) within the project budget. It is true that certain components and building systems will be more costly up front. The trick is to achieve offsetting savings in other areas of the design. This does not mean substituting inferior finishes to pay for a more expensive mechanical system, for example, but rather that true green design is a holistic approach whereby all systems and components that comprise a building are carefully considered from the beginning to explore synergies that will result in efficiencies and economies throughout.

The Cost of Green

Consider the example of classroom lighting. An inefficient light fixture not only uses more energy but also produces a great deal of heat, which adds to the HVAC cool-



Science Lab at Heritage Woods Secondary. Transparency and light are a major theme in this school. Classrooms facing inward receive light and have access to views by way of the multi-story atrium.

ing load. Thus, energy is wasted not only on lighting the room, but also on the increased amount of cooling required to compensate for the heat produced by the lamp. Using a green approach, efficient light fixtures (complete with daylight sensors for the row nearest the windows) in combination with large areas of high-performance glazing, and well-placed shading devices to eliminate solar heat gain (and glare), will all act together to result in a lowered cooling load. A lower cooling load in turn translates to a smaller, hence less expensive cooling plant. A smaller cooling plant requires less mechanical space, and so on, ... you get the picture.

While there is little doubt that the energy savings over the life of the building - not to mention the well being and better performance of students and staff - will pay dividends many times the cost of the green approach in the above example, the smaller cooling plant alone will likely not offset the initial cost of daylight sensors, high-performance glass and shading devices, and it requires careful consideration of the entire building design to achieve a first-cost-neutral green building.

Other components such as a ground-source geo-exchange system are even more capital intensive. On the other hand such strategies as building orientation, to minimize low sun-angle heat gain, cost nothing, yet could have a big impact on the size of the mechanical plant.

If you find yourself faced with the chal-

lenge of implementing green strategies into a building project either with the goal of LEED Certification or simply to achieve a high performance school based on the LEED model, the seven points listed below may provide a useful roadmap to achieving your objective within - or at least very close to - a standard project budget.

1. Commitment

Clarity of commitment by the decision makers in your organization is a key to success. Without a firm commitment from the client, the task of designing a green building will be like pushing a rope uphill. If possible, the school board should pass a resolution establishing clear goals for the design and construction of high performance schools, and specify what level of LEED or other standard the design team is expected to meet.

The project manager must champion the School District's interests throughout each of the project phases, and should ideally be experienced with the delivery of green buildings. In the absence of direct experience, a certain amount of education on the subject of sustainability will be necessary. There are many excellent resources available, including the web sites of the US Green Building Council, and the Canadian Green Building Council (CaGBC) - www.usgbc.org and www.cagbc.org. I can also recommend a number of great books, including *Natural Capitalism*, by Paul Hawken, Amory Lovins and L. Hunter Lovins; *Biomimicry - Innovation Inspired by Nature*, written by Janine M Benyus; and *Good News for a Change*, by David Suzuki and Holly Dressel, all of which are great primers on thinking green.

2. Experienced Design Team

To successfully design a green building

without adding to the project cost requires an experienced team of professionals with a proven track record of high performance school design. All of the individuals who comprise the design team, beginning with the architect, and including the mechanical, electrical, structural and civil engineers as well as the landscape architect, should have been involved with at least one LEED school project or equivalent. In the absence of experience, design solutions will tend to err on the conservative side, and will likely result in system redundancies and needless project cost overruns.

3. Clearly Defined Project Goals

The targeted level of performance for the school, including the desired level of LEED or other standard should be clearly communicated. The project manager should prepare a brief describing in detail the design objectives and specific strategies to be used in order to achieve the objectives. School Districts should consider engaging the services of a design professional with proven green design experience to assist in the preparation of the RFP terms of reference. This will eliminate much of the up-front work of the design team, and should help to reduce the fee premium for green design.

4. Integrated Design Process

To the extent that a true green building involves the harmonious interaction of all components, a total-systems approach to design is required. To that end, all consultants must be engaged at the outset of the project. The earliest of conceptual design meetings should take the format of design workshops or design "charettes," that involve the design professionals, the client's P/M and user group representatives. Invariably this process results in the discovery of a number of cost effective design

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The plan of Heritage Woods is organized around a light-flooded three-story atrium, which serves multiple functions. It is the social heart of the school, study hall, lobby, and eating space among others, and also plays an important role in the environmental control system. Warm air naturally rises in the atrium, and this is used to pull in natural ventilation from opening windows around the building through stack effect. At the top of the atrium, mechanical heat recovery units extract heat from the air, and use it to temper the fresh supply-air to the building, thus conserving energy. Ample daylight is brought into the interior of the building by way of high overhead clerestory glazing.

solutions that will help to ensure the desired green concepts are achieved within the project budget.

5. Green Design – not “Green Wash”

Green design must be integral to the process from the outset. Any attempt to make a conventionally designed building green by simply trying to add “green features” part way through the design process

will almost certainly result in much higher costs due to redundancies in systems, or require a complete re-design, which will double the design costs.

Furthermore, accept that green design will require innovation, approaches, and systems that may not meet the School District’s or the funding authority’s accepted standards, and that a high performance school will likely look and feel different from a traditional school building. Strict enforcement of design standards will impede the design team’s ability to implement the required innovations and will at best result in band-aid solutions that will almost certainly fall short of the design objectives.

6. Design Fees and Timing

Green design requires more analysis and consideration of various design options in order to achieve the level of systems integration required in a successful high-performance building. This requires more time than a standard design process, as well as additional design fees. However, in the hands of an experienced design team, the initial investment in up-front costs will pay huge dividends in terms of a more efficient, well integrated, and consequently less expensive building. As well, the additional design time will allow better coordination of contract documents, which in turn should result in fewer change orders during construction. Studies have shown that an additional 3% of the building budget invested

during the design stage in additional fees for design and energy modeling can lower the cost of construction by up to 10%.

If LEED certification is desired, expect to pay between \$10,000 and \$60,000 in additional design fees. The higher LEED ratings will tend towards the upper end of this range. However, as consultants become more familiar with the LEED certification process, these cost premiums can be expected to decrease over time. Again, if you want to achieve LEED certification for your project, engaging a team that is experienced with the process will result in time and cost savings.

7. Aim for the Low-Hanging Fruit

Focus on the green strategies that will yield the highest returns in terms of lower operational costs and improved user comfort, and those with offsetting construction cost savings. As well as those strategies, which will actually cost less to begin with, for example reducing the number of parking spaces below the minimum required by municipal standards or drought-resistant landscaping, which may eliminate the need for irrigation. My own experience has been that nearly all of the LEED credits for energy savings, as well as access to daylight and views, and controllability of systems, among others can be achieved within the project budget.

If for ideological reasons you or your organization feel compelled to achieve LEED Gold or Platinum and you have adequate funding, by all means go for it. But if your main interest lies in lowered energy consumption and maintenance costs, as well as maximizing environmental quality, you may find that a LEED Silver standard applied in accordance with the seven strategies outlined above will allow you to meet your objectives at little or no additional cost to the project.

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