50 Green Strategies that Cost Less

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With the experience that comes from being involved in the design of 90+ green schools, Innovative Design has learned many important lessons - none more important than the fact that green doesn't always have to cost more. In fact, Innovative Design has been able to integrate many sustainable design strategies and still keep our projects 5% under budget. There are several overall design strategies that are responsible for this remarkable track record. The first is simple: there are many design trade-offs in any project, any of which will still meet or exceed the owner's objectives. If you begin a project as the designer with the belief that sustainability is an important component of the design, you will view the trade-offs in different ways. Since 1977 Innovative Design has been responsible for over 4,400 projects and 4,400 have incorporated solar energy solutions. Where there is a will, there is a way.

The second strategy is also simple. Just select green options that cost less to begin with. This isn't as easy as it may seem for firms with less experience in green design. But, there are numerous ways to be green without spending the green. The following list represents sustainable design strategies that we have implemented in schools that actually cost less than conventional, non-sustainable strategies. It should be noted that most of these strategies will cost less in almost any project while some might, given different circumstances than we experienced, cost more.

The intent of this is to list only those that have the possibility of actually costing LESS. There are many additional strategies that are also very good investments that can be recouped by the owner within a few years. We recommend to the owner that these green features also be implemented. And, there are green features that should be done regardless of cost. Strategies that impact health and productivity are hard to put a dollar return on. Our goal in most projects is to develop an entire green package that will be totally recouped financially by the school system within two to three years.

The following green strategies for educational facilities should always be considered – they make sense anyway you look at it.

Overall Concepts

- Think whole-building, not individual measures. It is very typical that one green feature, by itself, won't be less expensive. But, in combination with others, the overall impact on the cost is to lower it.

- A very basic concept taught to every architectural student is that form follows function. When this concept is practiced, the result is almost always cost savings.

Community

- Maximize your community's resources by analyzing facilities that could be jointly and beneficially used by more than one group within the community. A church and your school could share parking, a town library system and the school could eliminate the need for duplicate space that could serve both, or a constructed wetland could be used by several surrounding neighbors to solve their common erosion problems, for less money. Sharing recreational facilities is often a real opportunity for significant savings.

- Design your pedestrian paths so that they provide easy, safe access from the residential areas of the community to the school. To facilitate this, analyze the surrounding neighborhoods within one mile from the school site, the necessary road crossings, and the sidewalk system, to better understand where key links can be made. If pedestrian access is improved, car-stacking lanes become less critical.

- Take advantage of public transportation that can alleviate the need for additional parking spaces or stacking lanes.

Site Design

- Take advantage of your site by properly orienting your school to maximize its southern exposure and minimize east and west glazing.

- Utilize existing trees, landscaping and natural berms. Vegetation and berms can serve to protect against the winter winds. Trees can often help in reduce unwanted solar gain that could increase peak cooling loads.

- Incorporate or retain indigenous vegetation to minimize water needs. Xeriscape planting strategies cost less money upfront, and they save on water use for years to come.

- Retain site features that can later serve as 3-D teaching tools. Wooded areas that can serve as interpretive spaces are one example. Fully understand the science curriculum and maximize the site as a means to enhance experiential learning.

- Locate your building on the higher part of the site in order to take advantage of natural slopes for drainage.

- Keeping parts of your site "natural" and not planting grass can save first costs as well as eliminate the need for continual mowing and watering.

- Utilize on-site ground cover and mulch from existing vegetation for landscaping.
- If a prototype design is used, make sure it makes sense for the site, particularly in relationship to orientation and contours.
- Utilize properly graded bio-swales in lieu of pipes.
- Balance cut and fill.
- Use the pavement that is part of secondary fire lanes as the pavement associated with the hard-surface play areas (basketball courts, etc.).
- Often a constructed wetland, by itself, will cost slightly more than a retention pond. A rainwater catchment system will typically cost more. But together they often cost less because the civil piping costs are practically eliminated.

Daylighting and Windows

- Daylighting is a strategy that has many benefits including saving energy, increasing productivity, and improving health. Our history is that these strategies have simple dollar paybacks ranging from two or three years to applications that have less first cost. When selecting the most cost effective strategies, choose the spaces that are used the most and are to be air-conditioned. Gymnasiums are used year round and well into the late afternoon. They also typically have no ceiling cavity, which produces a much lower initial cost.
  Administrative areas are also very well utilized. However, classrooms are where the students and teachers spend the most time and where productivity benefits are the most important.

- In classrooms that are to be daylit from lightshelves, slope the ceiling from the window down to the interior wall. This will allow you to maximize the high clerestory glass areas uniformly across the exterior wall while still allowing for mechanical ductwork close to the halls. This sloped ceiling approach increases performance of the daylighting and enables the designer to reduce clerestory area. It can also help eliminate the need to increase the floor-to-floor dimension in multi-story buildings.
- Use clear, double-glazing in the glass areas that are integral to your daylighting strategy. You want to maximize the visible light transmission. Even using low-E glass in roof monitor areas or clerestory areas will hurt performance and run up the cost of the entire daylighting.
- Don't use any more glass in your daylighting strategy than is necessary to achieve your lighting level objective during peak cooling times. Over-glazing increases cost as well as peak cooling loads.



- Eliminate east and west facing glass and only utilize view glass where there is a purpose – not just to balance the design elevation.

- Tinting your unprotected east and west facing windows can typically reduce peak cooling loads and, in turn, reduce installed cooling equipment.

- Utilize other building elements such as covered walkways or even adjacent buildings to shade east or west glass.

- Utilize automatic dimming strategies that are tied to your EMS to insure peak load reductions. While not appropriate in all applications, an example where it may make sense is a gymnasium that could be dimmed from 40 footcandles to 35 footcandles just at the peak cooling hours.

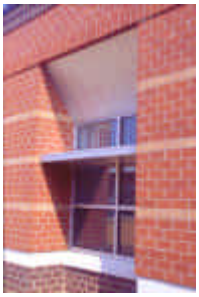
- Use ganged fluorescent light fixtures in the gymnasium. They can cost less and provide an additional advantage by being able to be dimmed.

- In well daylit spaces, even on the most overcast or snowy day, the daylighting will be able to provide about 10 footcandles of light. By evaluating the lighting requirements in classroom spaces, it is often found that the lighting requirement at night is not what it is during class time. A typical example might be a classroom that needs 50 footcandles during the day and only 40 footcandles at night when the space is used for parent-teacher meetings or by a single teacher in a particular part of the room. In this common situation, 20 percent less lights can be installed initially.

- In daylit classrooms, a typical problem is that there is too much light at particular times to use overhead projectors. In the past, the main strategy to deal with this problem was to incorporate operable shades. The problem is that these shades often would be left closed, blocking the daylighting and negatively impacting energy savings. By incorporating architectural features within the classroom to shade the projection screen area, the operable shades can be eliminated, reducing first costs and guaranteeing energy savings.

Building Shell

- Use white, single-ply roofing material. Ninety percent of heat gain from the roof is the result of radiant gains. A white single-ply roof has several advantages: it stays reflective a long time; it can be utilized to bounce a certain amount of light into daylighting apertures, thereby reducing the size of this glazing; and it is ideal for rainwater catchment system collection areas.


- Choose light colored exterior wall materials to reflect solar gain.
- Use lighter paint colors as they typically have the less VOCs.
- To help improve lighting inside rooms, paint interior walls light colors, select highly reflective ceiling materials, and don't pick extremely dark floor finishes. The lighter the finishes, the fewer the number of lights that have to be installed. This is true for daylit as well as non-daylit spaces.
- Properly placed radiant barriers can reduce installed cooling equipment enough to often offset the cost of the material. Added performance benefits can be realized by also utilizing the radiant barrier as an infiltration/exfiltration barrier and placing the ductwork below this sealed barrier.
- Develop the design based upon even modules for materials. It will reduce material waste and save time.

- Use building elements as 3-D teaching tools. A picture is worth a thousand words but the real thing is better than a whole book.

Electrical Systems

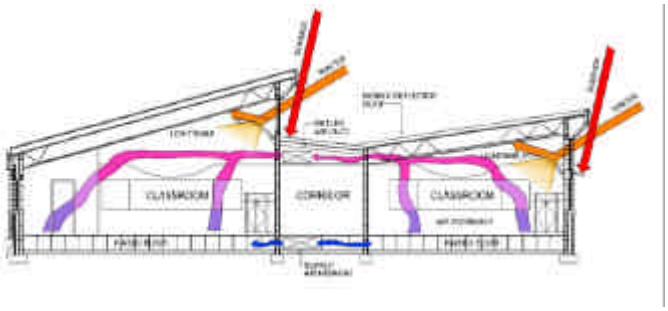
- Consider photovoltaic lighting in remote locations where conduit and trenching costs can exceed the cost of the PV.
- Limit exterior lighting to critical areas only.
- Don't over light hallways.
- Reduce nighttime light pollution by selecting the correct light fixtures.

Mechanical Systems

- Analyze your seasonal and hourly loads carefully to determine full-load conditions. This may allow you to downsize your chiller and not significantly impact comfort.

- When selecting your chiller, make sure you accurately account for the benefits of daylighting in terms of cooling load reduction.

- Lay out the chilled and hot water lines as well as mechanical ductwork to minimize turns reduce friction.



- Optimize the mechanical system as a complete entity to allow for the interaction of various building system components. Don't oversize your equipment, particularly the cooling.

- Use displacement/stratification strategies to heat and cool only where the people are. This benefit can often be utilized in daylit classrooms that have higher ceiling areas, media centers, multi-purpose spaces, and gymnasiums.

- When sizing your mechanical equipment, investigate the unit sizes. It may make more sense to actually increase other design elements (insulation levels, etc.) to help reduce the overall cooling load downward to the next chiller unit size.

- The use of environmentally sound on-site waste treatment systems like the Living Machine ™ can actually cost considerably less if the next best option is to extend the central sewer line a half-mile or more.

- A rainwater catchment system that provides ninety percent of the school's water needs can, in some cases, be supplemented with a low-flow well (mostly for potable needs), to provide a less expensive solution than extending a central city water line.

Recycling and Environmentally-Sound Materials

- During construction, require the contractors to recycle materials that have a local market. Once they understand that there is a market for recycled material, they will see that they can make money at the same time they help our environment.

- As recycling efforts increase, more and more recycled building products and materials cost less than traditional ones.

- Buy local products, materials and equipment. It helps the local economy, reduces embodied energy associated with transportation, and is typically less expensive.

