

Green Building Design

By Scott Somers, NCARB, President ARCH-101
www.arch-101.com ssomers@arch-101.com

Going “green” is no longer a new concept in the design and construction world. Are you interested in incorporating “green” design practices in your office? Should you? What are the cost impacts? This article discusses the latest in “green” design for orthodontic offices.

For those who are not yet familiar with “green” design, the following is the definition from Wikipedia:

“...the practice of increasing the efficiency with which buildings use resources – energy, water, and materials – while reducing building impacts on human health and the environment, through better siting, design, construction, operation, maintenance, and removal – the complete building life cycle.”

For most architects, it is hard to argue against the benefits of sensitive environmental design. Building “green,” though, takes on varying levels of sensitive design, such as:

- **LEED** - Many federal and state projects now follow LEED guidelines (Leadership in Energy and Environmental Design rating system), which represents the US Green Building Council's (USGBC) effort to create a national standard for what constitutes a “green building”. Within the LEED green rating system, there are currently differing levels of “green” certification, including: Certified, Silver, Gold, and Platinum. Each level of certification is certified on a points system as determined by the USGBC.
- **Sustainable or “Green” Design** – This simply refers to utilizing the practices, in varying levels, as described above by

Wikipedia, without materials, methods, or procedures governed or measured by any authority. Sustainable design can be as simple as using paints with low odors and/or installing flooring made from recycled materials. It can also be as simple as using locally manufactured products. These are more subjective “green” design practices, and the benefits are not easily measured, though the goal is true.

Though many of its design practices appear to make good sense, no one can guarantee what type of cost savings or environmental impacts green design ultimately provide. The truth is that accurate measurement of the total impacts to the environment may be impossible. For example, if a particular carpet, was determined to be a “green” product, we are assuming that the materials used to produce the carpet are either recycled or environmentally sensitive materials. But what was the manufacturing process used? What types of energy did the manufacturer use? How efficient were they compared to other manufacturing processes? What types of emissions were produced? How is the product shipped and how much fuel was used in its transportation? How far did the workers drive to the plant to make the product? What types of waste did the manufacturing process produce and how was it re-used or disposed of? So “going green” is not a simple idea or process.

Cost

Initially, building green also comes at a cost, which is typically higher than using conventional construction materials and methods. The general idea behind green

design is the efficient utilization of natural resources and sensitivity to the preservation and perpetuation of our natural environment. Green design *theoretically* saves water and energy (reducing utility costs), reduce waste, promote the use of local natural resources, improve air quality of the indoor environment; and generally promote a sensitive use of natural building materials. Many of these benefits are theoretically realized over the *life* of the building.

Architects can offer design ideas for green design, though they are prohibited from making any type of guarantee of the impacts on the environment or project costs for utilizing green design. There are several factors behind this. A green building (or sustainable building) requires a green approach *for the life of the building*. A green building, at least measured by LEED Certification, *must* be designed, built, renovated, operated, maintained and/or reused in a way that it was originally designed as a system. Future operations and maintenance must at least meet the original design intent. For example, if a window is broken, it should be replaced with the same window. Or if the HVAC balancing degrades, it should be periodically be checked to see if it maintaining peak performance. If plumbing fixtures fail, they must be replaced with the same fixture or a more efficient one.

What Possible Economic Benefits Might Green Buildings Offer?

Green buildings, depending on the levels of sustainable material used, may initially cost more up front, but the trade-off is over the long haul. Through savings from efficiently designed building systems, energy costs should, be lower. Many even theorize that a green approach to building may keep workers healthier and more productive, thus saving

labor costs. Remember, green benefits are designed to be over the life of a building. If the building was originally designed to be green, all building components need to be replaced with equal or better systems and/or serviced in the same manner. Take the following for example: If a window breaks, the roof needs to be replaced, the mechanical system has run its course, lamps burn out, flooring wears out, ceiling tiles need replaced, or toilets breaks- these would all fall under the same rule mentioned above.

A green building can be compared to a high performance racing car (though the racing car is not technically, "green"). If the engine is always tuned, the car is designed for the least possible wind resistance, the fuel tank is full, the brakes are finely calibrated, and the tires are in excellent condition, the vehicle runs flawlessly with the continuous assistance of the expert pit crew. If one or more of the components or systems breaks down and is either neglected or replaced with sub-standard performing components, the race car operates slower, gets poorer mileage, and if not taken care of, can require large amounts of time and money to get back into racing form.

To reiterate, benefits of green design are found to improve the following:

- occupant health
- comfort
- employee productivity
- reducing the need for using precious natural resources
- reducing pollution and landfill waste are not easily calculated

However, because these effects are not easily calculated, it is extremely difficult to predict overall savings to the life of a project (if any). If you are looking to design and build a green building, it is prudent to set aside a contingency for costs that may be associated

with less tangible green building benefits, costs of researching and analyzing green building options, and possible costs associated with their construction.

Elements of Green Buildings

The practice of building green has several components which are constantly being refined. The following is a rough outline of green building practices.

Building Orientation / Location

- Determine how the building can be oriented on the site to best take advantage of capturing sunlight, water run-off, natural shading, etc.
- Find a site that is located near mass transit or a central, accessible location.
- Use plants and landscaping that require little maintenance and reduced requirements for water. Use rainwater to irrigate.
- Use exterior paving systems that are recycled and/or do not pollute the storm water runoff from the roof and paved areas.

Sustainable Building Materials

- Utilize local building materials. Find materials that have recycled content and also have negligible levels of harmful chemicals. Use materials that can be recycled in the future.
- Try to, if possible, design around the natural sizes of building materials to reduce waste. Most dimensional materials are available in 4 foot increments.
- Devise a system of recycling wasted building materials instead of taking them to landfills.

Water Efficiency

- Many codes dictate the use of low-flow plumbing fixtures.
- Use recirculated hot water from heating systems for personal hot water. Use instant-hot water systems for areas far from hot water heaters.
- Provide separate water metering for irrigation systems.
- Create a water budget.

Energy Efficiency

Many states have energy codes that provide guidelines for minimum allowable energy performance requirements for all new commercial construction. Most often, building efficiencies can be designed to higher performance levels than those spelled out in the codes.

- Again, passive solar design can naturally assist in maximizing heating and cooling conditions for buildings. Studies also have shown that natural light can provide positive health benefits.
- Efficient lighting practices can include utilizing energy-saving lamps; lighting systems can be put on timers or photo cells. Use lighter wall colors to reduce the total amount of light needed in a space.
- Use high efficiency glazing systems and reduce the amount of direct sunlight that goes into a building. Direct sunlight will always heat the surface it touches; therefore, it is always better to stop direct sunlight BEFORE it reaches the interior of a building.
- Use lighting modeling software to calculate total heat loads from people, equipment, lights, building systems, appliances, etc.
- Use the highest efficient heating and cooling systems possible, including geothermal or hydronic heating.

Healthy Design

- Clean air has been proven to reduce respiratory disease, allergies, asthma and other airborne related illnesses. Use high quality air filtering systems throughout the building and ensure that all areas are appropriately ventilated.
- Select paints and materials that have zero or low off-gassing.
- Use organic cleaning products for building maintenance.
- Provide appropriate positive water drainage, ventilation and humidification levels at all areas of the building to avoid possible formation of mold, smells, mildew, etc.
- Purchase green furniture and office products.

Building Service and Maintenance

As mentioned earlier, a green building is composed of many components. To fully realize the value of a green building, all maintenance and operations must follow the prescriptive methods spelled out in the original green design for the life of the building. A green building is never static; it constantly changes and people have to ensure the changes meet and/or maintain the original green design intent.

Successful Green Design Results

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Successful Green Design Results

As with all building projects, a green building should be identified as a strategic goal of a project before the project even starts. Develop a clear, concise summary of what performance levels you would like your building to achieve. Also, have a clear understanding of what these standards mean to the costs, maintenance and operation of your building. Seek professionals who are experienced in green design to assist you to

develop a realistic approach to your green goals. Make sure your contractor understands your green goals, as they may be an integral piece of your green building project.

There are different levels of green design. Many elements of a truly green building are affordable options that are easy to incorporate into projects without breaking the bank. Many materials now come with green options, such as paint, carpet, wallboard, siding, roofing, fabrics, furniture, paper products, etc. In other words, you can be sensitive to green sensitively green project without going all green.

Where to Find More Information

The U.S. Green Building Council at www.usgbc.org has a wealth of information on the latest green and LEED (Leadership in Energy and Environmental Design) guidelines. Also, the following website offer excellent green content:

- National Resources Defense Council (NRDC) www.nrdc.org
- BuildingGreen.com at www.buildinggreen.com