



# Eco-Link

*Linking Social, Economic, and Ecological Issues*

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## The National Green Building Movement

### Green Buildings - What Are They?

Ten years ago any reference to green in the building construction industry would have translated to either profits or to the color of the countertops. Today, however, “green” is widely understood to refer to environmentally responsible design and construction. In a green building, the environmental characteristics of construction materials receive more attention than traditionally as do energy efficiency, water management, waste reduction, building durability, and occupant safety and health.



### Why Green Buildings?

The beginnings of the green building movement in the United States can be traced back to disruption of imported oil supplies in the 1970s.<sup>1</sup> After a period of initial shock, and a number of emergency actions to conserve energy, communities across the country began providing funding to homeowners to “weatherize” dwellings. The idea was to seal and increase insulation in buildings so that heat would not leak out of them, thereby reducing energy use. Holes were drilled in walls and insulation blown in, strips of insulation were placed around door openings, putty-like caulking was applied around the outside of windows and door frames, and plastic films were put over windows.



An unanticipated result of efforts to highly insulate and seal-up buildings was that some buildings that had been in service for many decades began to noticeably deteriorate. Mold and mildew problems also became common. The reason for these negative outcomes was that although leaky buildings wasted energy, they also allowed moisture-laden indoor air to escape freely through walls without causing problems. Leaky buildings also allowed pollutants (e.g., from stoves, carpeting, paints and adhesives) to escape. When buildings were sealed or more highly insulated to prevent energy loss, usually without adding some kind of controlled ventilation system, pathways for escape of moisture and pollutants, and for movement of fresh air into the building, were eliminated. The result was condensation and build-up of moisture within walls and dead-air spaces (such as in closets), where it wasn’t wanted, trapping of indoor pollutants, and loss of the source of fresh air.



<sup>1</sup> On October 6, 1973, Syria and Egypt launched a military attack on Israel starting the Yom Kippur War. Four days later Arab countries placed an oil embargo on the United States and the Netherlands because of their efforts to resupply Israel during the conflict. Oil output was also reduced 25 percent. The market price for oil quadrupled and supplies dwindled, leading to imposition of price controls, gas rationing, and significant disruption of everyday life. A second oil crisis occurred in the United States in 1979 as a result of the Iranian revolution.

## Why Green Buildings continued...

Health problems and damage to buildings that required expensive repairs followed attempts to increase energy efficiency. Many people decided that it was better to waste energy than to endanger health and damage to buildings, so progress in saving energy stalled.

As it turns out, people in Sweden and Finland long ago recognized that the building of energy efficient structures that worked as intended required thinking of buildings in a systematic way. After all of the difficulties experienced in the United States and in other countries, some people began to look to knowledge from northern Europe, and to think about some kind of program to help builders create highly energy-efficient, durable, safe buildings. This was the beginning of the green building movement.

### Green Building Trends

Green building is now a well established trend. For instance, according to one recent estimate, more than half of builder members of the National Association of Home Builders, who build more than 80 percent of homes in the U.S., will be incorporating green practices into the design, development, and construction of new homes. —

Another measure of green building program growth is the number of cities that have established or adopted green building programs. In 2008 the American Institute of Architects reported that 92 cities with populations greater than 50,000 had established green building programs, up from 22 just four years earlier, a 318 percent increase (Figure 1).

Figure 1



### U.S. Green Building Programs Background/Current Situation

The world's first green building program was developed in the United Kingdom by a research organization known as the Building Research Establishment. Within a few years this program began to be used in North America. Its development also led to development of a number of other green building programs.

Initially, green building programs tended to focus on energy efficiency, occupant safety and health, and building durability. As these developed, issues such as water efficiency, environmental impacts linked to building materials production and use, and impacts to the building site were included.

Today, there are more than 80 green building programs operating in the United States, and several in Canada (Figure 2). Most of the U.S. programs are city, county, or state programs, but three are national in scope.

Figure 2



The three green building programs of national scope in the United States are the Leadership in Energy and Environmental Design (LEED) program of the U.S. Green Building Council, the Green Globes program of the Green Building Institute (the program that was designed by the UK Building Research Establishment), and the National Green Building Standard of the National Association of Home Builders. All of these programs were developed and operate outside of government.

## How Green Building Programs Work

Most green building programs focus on a number of environmentally-related categories including energy efficiency, water efficiency, waste reduction, environmental aspects of construction materials, indoor air quality, and building site impacts. A number of requirements in each of the above categories must be met, with credits awarded for meeting additional criteria. Buildings earning sufficient credits earn a “green” rating; the higher the number of credits, the higher the rating.

## Green Building Programs and Building Materials Selection

Although the impact of green building programs is generally positive, there are problems in most of them that detract from their effectiveness. One of the current shortcomings in almost all green building programs in use in the United States, is that the criteria for identifying lower impact materials are based on intuition rather than science and frequently rely on single characteristics of a product, rather than considering full life cycle impacts. For instance, almost every program gives preference to the use of recycled content products. When comparing products made of similar materials (for instance a garage door made of 50 percent recycled aluminum and one made entirely of virgin aluminum) the preference for recycled content criteria is obvious: the high recycled content product has a much lower environmental impact. However, when comparing dissimilar materials, use of a recycled content product does not necessarily have a lower environmental impact. Consider, for example, a wall framed in steel containing 30 percent recycled content and a wall framed in wood that does not include recycled content. In this case, building the steel-framed wall requires 3 times as much energy and results in 3 to 11 times greater emissions of greenhouse gases, and over 40 times the emissions of such compounds as non-ferrous metals, ammonia, cyanide, phenols, halogenated organics, and sulfides. In other words, following the guidelines of many green building programs can actually lead to the production of high environmental impact, rather than low environmental impact structures.

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## U.S. Green Building Programs continued...

Getting away from intuition-based designation of environmentally better materials and basing such designations on systematic, scientific analysis is today possible through the use of environmental life cycle assessment (LCA). The LCA approach also provides a way to compare different materials on the basis of consistent, measurable characteristics of their environmental impact. Basically a life cycle assessment involves use of a sophisticated accounting system to track inputs of raw materials, energy, water, and other inputs, and outputs of products, co-products, emissions, effluents, and wastes in manufacturing a product. This kind of assessment can also be used to track impacts linked to product use, maintenance, and disposal. The Green Globes and NAHB green building programs, mentioned earlier, award credits for use of life cycle assessment in selecting construction materials. Other programs, such as LEED, have to this point been curiously resistant to the incorporation of LCA in their guidelines.

### Summary

Urban Building green grew out of the oil shocks of the 1970s and is a rapidly growing trend. Such programs focus on energy and water efficiency, occupant safety and health, building durability, waste reduction, use of environmentally preferable materials, and site impacts. Over 80 green building programs in the United States and Canada are causing architects and builders to think carefully about the environmental impacts of the structures they are creating.

A number of green building programs now in operation do not use systematic analysis in determining which building materials are environmentally better than others, instead basing designation of environmentally preferable materials on intuition or single attributes. This practice is unfortunate since it can lead to use of high environmental impact materials and structures.

Life cycle assessment is a powerful tool for use in determining environmental impacts and targeting efforts to improve environmental performance of both products and manufacturing processes. Currently there are several well designed, free or low cost, and easy to use computer programs that provide life cycle assessment results for building products, building components, and whole buildings. The good news is that all green building programs need to do to greatly increase their effectiveness is to incorporate the use of LCA within them.

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