90EE BUILDING DESIGNTEC

OR

90% BETTER ENERGY EFFICIENT BUILDING DESIGN AND TECHNOLOGY

Green and sustainable building refers to an urgent need in this country, indeed the world, to pay attention to the alarming rate our resources are being used up in the construction and operation of our homes and workplaces. According to the United States Department of Energy (DOE) 40% of the energy in the United States is used to heat and cool the buildings we live and work in. As important as many other aspects of green/sustainable construction are, the need to reduce the amount of energy used is vital to our immediate and long term future. Thomas Friedman, in his new book Hot, Flat and Crowded: Why We Need a Green Revolution, exhorts us to become "the world's leader in innovating clean power and energy efficient systems". He admonishes "Coasting along and doing the same old things is not an option any longer. We need a whole new approach. As they say in Texas "If all you ever do is all you've ever done, then all you'll ever get is all you ever got." And all we ever got was the mess we're in now. Global warming, petrodictatorships, rampant energy misuse, pollution, depletion of water supplies, species extinction, and deforestation are just a few of the problems facing us today, according to the website www.arlingtoninstitute.org and its discussion of The World's Biggest Problems. The green revolution is a good start in the fight to regain order and harmony in the world. Producing very energy efficient buildings is a vital part of that fight.

There are many commendable rating systems that help us measure the amount of energy that will be needed to operate our buildings. The most basic are the building codes, with the most prevalent being The International family of Codes, by the International Code Council (ICC). The International Building Code (IBC) and International Residential Code (IRC) provide minimum standards that must be met when constructing a building in any of the jurisdictions who've adopted the IBC and IRC and govern such activities. However, to highlight the basic nature of this standard, it has been said that a code built house is the worse house you can build without breaking the law. The International Energy Conservation Code (IECC) lists the minimum energy efficiency standards, and there are several computer programs that measure if a building passes that code. However, these programs, such as RESCheck by the DOE, only list the percentage the building fails or exceeds compliance with the IECC. And again, this is the minimum standard required.

Energy Star is another rating system by the DOE. As stated in the website www.energystar.com "ENERGY STAR qualified homes are at least 15 percent more energy efficient than homes built to the IRC." Energy Raters are employed to determine whether a building meets that standard, based on the use of climate appropriate insulation and doors/windows, airtight construction, and efficient heating, cooling, lighting and consumer appliances. The rater uses a HERS (Home Energy Rating System) point system with an energy efficiency software package to perform an energy analysis of the home's design. A home built to the IECC standard scores a HERS Index of 100, while a net zero energy home scores a HERS Index of 0. The minimum required HERS index for cold climates is 80 (20% better than the IECC code home) and warm climates is 85.

The US Green Building Council (USGBC) has developed the Leadership in Energy and Environmental Design (LEED). This is a system that awards points for all of the green aspects of construction or operation of a building, partially including sitework, utilities, construction, finishes, and operation/maintenance. Energy efficiency is one area that receives points, with the minimum standard being an Energy Star home. No further efficiency standards are necessary if other aspects of the LEED point system provide enough points to satisfy the requirements to achieve the rating desired. The system is full of trade-offs that allow inefficiencies as long as the desired Certified, Silver, Gold or Platinum rating is achieved.

Another program gaining precedence is the "Beyond Code" energy efficiency standards, as outlined by Southwest Energy Efficiency Project (SWEEP). While building energy codes set a floor on the energy efficiency of new buildings, it is possible to move well beyond minimum code requirements and reduce energy use in new buildings by 30% or more very cost effectively. This is a positive step in the right direction, and is being adopted throughout the southwest United States, in Arizona, California, Colorado and New Mexico.

All of these standards show that people are waking up to the fact that energy efficiency is an important part of the "green revolution". However, there is one standard that far surpasses all of these. It is called Passivhaus, and is being adopted all over Europe. It was developed in Germany by Professors Bo Adamson of Lund University, Sweden, and Wolfgang Feist of the Institute for Housing and the Environment, Germany. In short, a home built to this standard will heat and cool at 10% of a typical code built home. That is 90% more efficient, a far cry from 15%, 20%, even 30%! The European Commission is promoting passive-house building, and the European Parliament has proposed that new buildings meet passive-house standards by 2011. Since the first Passivhaus was built in Germany in 1990 there are now about 20,000 Passivhaus buildings across Europe. Most are new homes or apartments, but refurbishment projects, schools, offices, sports centers and fire stations have also been built to the standard. In the United States, the Passive House Institute of the US (PHIUS) is authorized by the Passivhaus Institut (founded by Dr. Wolfgang Feist) as the official certifier of the Passive House standard in the US. There are a number of Passive Houses built in the US, from the East Coast, to the Midwest, to the West Coast. PHIUS has developed training programs for consultants to certify construction of US Passive Houses. Programs are scheduled for both coasts and the Midwest this summer and fall. There are currently Passive House Consultants in over 12 states across the country.

Passive House is the most aggressive standard yet devised that is achievable. Zero Energy Homes (ZEH) standard has a similar goal, to reduce the amount of energy required to operate the home, but the ZEH standard relies on the addition of renewable energy generation equipment, such as photovoltaic (PV) systems or wind generation. These can add several 10's of 1000's of dollars to the cost of a home. Passive House design focuses on energy efficiency, especially in heating and cooling. This is achieved by superinsulation techniques, air-tight envelope construction, and controlled air infiltration via heat recovery ventilators. These homes can, and have been, built for little or no extra cost over conventional construction, mostly due to elimination of expensive heating and cooling plants. Lifetime costs, such as fuel expense and maintenance costs, as

compared to conventionally constructed homes, are minimal, in the fullest sense of the word.

The main drawback with the Passive House standard is its origin. Being developed in Europe, it is based on European building codes. While similar, conversions are still necessary, and an understanding of European codes is helpful. PHIUS just recently translated the Passivhaus Institute analysis software, Passivhaus Planning Package (PHPP), into English and added climate data for 40 American cities. While this gives a fairly broad spectrum to draw from, it still is not fully conclusive, given the wide variability of micro-climates in this country. There are American innovations in construction materials and methods that could not be accounted for as well, such as engineered lumber, where "in Europe and Japan, LVL and I-joists are in the early stages of development" according to the website www.bis.com.au. I-joists have been used as wall framing in some of the Illinois Passive House's. Also, the ICC, and the early building code developers, have spent decades developing the building codes in use today that serve as the minimum standards for construction in this country. This prompts the need for a Passive House like standard that is uniquely American.

The Master of Science Plan B Engineering Report program at CSU is a good vehicle for development of this highly efficient building construction standard tailored for America's unique variations. 90EE Building DesignTec has been chosen as the name of this standard. The acronym comes from the phrase "90% better energy efficient building design and technology". To achieve this standard, first the IECC needs to be examined and studied to determine what the minimum standards are regarding energy efficient building construction. These values will be itemized according to sub-categories, such as envelope, openings, lighting, ventilation, etc. A value equal to 10% of the energy use for each category will be assigned. Construction methods and materials will be examined and analyzed for compliance with the standard. Costs of construction will be predicted to assure economic feasibility. A final report will be prepared summarizing the standard and the results. Please consider the importance of this subject, and approve the request.

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