Green Design

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Ancient in technique, futuristic in technology, Green Design draws on the entire available spectrum of options in developing architectural design solutions to the mutual benefit of both the environment and the human beings living in it. Faced with complex building decisions, architectural designers have options. They can employ current established and proven technologies, or a low-tech approach utilizing centuries-old techniques, or cutting-edge technologies many of which are in their development stages. Commonly, one approach is relied upon to an extent that limits potential. Successful Green Design employs them all, with thinking and problem solving that is inclusive, team-oriented, and familiar with techniques that are ancient, currently established and developing.

Maxim Benefit of Place

The premise of Green Design starts with maximizing the benefits of place – land form, weather conditions, sun position (south-facing structures in cool or moderate climates where heat is wanted, north-facing structures in hot climates where heat is not wanted), available geology and water conditions, site materials, prevailing winds. Assessing these characteristics requires intensive site analysis prior to conceptualizing the design. The design can then emerge from and be responsive to an intimate familiarity with the site and its environs.

The Redmond Residence is one of our recent design projects in northwest Washington State. It is situated at a high point on the site taking advantage of cooling summer breezes, exposed to the south for maximum solar gain, protected by existing woodland from the southwest to reduce winter wind exposure, by land form and tree to reduce some of the intense western summer sun exposure.

The landscaping at Nature's NW, a market in Oregon State, establishes a forest to reduce exposure to winter winds. The design utilizes primarily native plant materials, which are adapted to existing environmental conditions and therefore require little water or energy once established. These connect what could be a vast expanse of pavement with its surrounding environment in a manner that is familiar and attractive to customers, as well as beneficial to the environment.

Careful thought must be given to sustainable use of resources at all times. The need to transport materials over long distances or the manufacturing processes or the abuse of dwindling resources must always be taken into account when designing anything. A particular design may be perfect for the situation but

require resource destruction or excessive expenditure of energy to apply. Tufo, the volcanic building stone of Italy, may be the right material for a specific situation in the US but the energy and shipping costs outweigh any benefit. Alternate local materials selections may achieve similar function, be aesthetically suitable and express regional character.

Passive Building Techniques

Passive building techniques acknowledge the existing site and surrounding environmental conditions, using those conditions beneficially without introducing active technology. The execution of this inventive thinking varies from region to region, from site to site, and includes building solar apses (a quarter sphere directed toward the sun's position) in cool or temperate climates, and utilizing roof forms to moderate seasonal extremes. Burying portions of buildings for the stability of the earth's temperature, using light scoops, reflectors and louvers can all help manage day-lighting conditions while controlling thermal gain or loss.

Seasonal sun angles can be calculated to help develop solar apses (The Romans created solar apse structures facing more or less south, depending on regional weather conditions and prevailing cloud cover). By making structures receive and trap the sun in the winter months then shade and limit the sun in summer a more temperate condition can be created. These forms do not have to be literal apse shapes – in one project we created a shed-style structure facing south with a major glass area – the overhang of the roof was calculated to expose the glass in winter, then shade it in the summer. On another project we used louvers that allow winter sun to reach the glass surface and restrict the sun during the summer.

Creative use of natural insulation that is responsive to the changing seasons can have great effect. Roof forms can be planned to reflect steep summer sun radiation and to hold substantial snow in winter. They act as excellent insulation, as snow structures, or igloos, have done for nomadic arctic people.

At the Redmond Residence roofs and their overhangs are configured to help control seasonal sun exposure and to collect and control water. The water from the roof supplements a system that runs a stream through the home, offering it visual and aural beauty while supporting balanced temperature and humidity levels.

Technologically Passive Materials and Techniques

Technologically passive materials are familiar materials utilized in new ways, such as engineered fiber products, bio plastics or concrete recipes adjusted to improve thermal performance. Technologically passive techniques bring together the inventive use of materials and non-mechanical systems (those that do not require supplemental energy). Utilizing concrete walls with embedded piping to transfer heat is a technologically passive technique. The installation of

thermo-siphon transfer piping in a sun-facing concrete wall can transfer the gained heat to other locations without a mechanical system.

Concrete can be configured with varying recipes for a number of creative applications. By adding silica to a concrete mix a product much like volcanic Tufo stone is created. Tufo is high in silica and holds moisture in a stable way, making the structure more temperate with each season. A specially adapted concrete mix at the Redmond Residence is designed to improve its insulating properties.

At Nature's NW, bio-plastics made from agriculturally based materials are used in counters and flooring with good performance characteristics and excellent aesthetic qualities. Structural components of engineered wood materials and grass fiber wall panels are resource efficient, attractive, and expressive of the underlying concept of the market.

Active/Mechanical Techniques

More progressive 'high-tech' solutions are currently developing at an extraordinary pace. Some of these techniques are relatively established and see regular incremental improvements, such as the use of geothermal heating and cooling, wind power and low headwater generators, and the application of photovoltaic technologies. Other examples are more progressive and represent leaps of thinking and technology. In the bionic building of the future, smaller components will be self-regulated by individualized computer sensors to maximize day-lighting, improve ventilation, transfer heat, shed and collect water, and balance individually-zoned environments.

Both the Redmond Residence and Nature's NW employ computer technology coupled with heating and lighting systems to maximize efficiency. These highly controllable environments respond automatically to the ever-changing characteristics of temperature, daylight, and usage levels, featuring stage-like settings to respond to pre-program anticipated moods. These technologies can offer groundbreaking solutions as well as make subtle improvements both to the experience and the efficiency of the built environment.

Green Design will employ several of these approaches simultaneously. Creative solutions emerge from having a diverse general knowledge of the attributes of the question, thoroughly considering and balancing the potential solutions and their associated technologies, and working in teams. Technologies are developing at unprecedented rates. It is critical to be familiar with these technologies and to know how to work with qualified specialists who can bring their focus and depth of knowledge to the overall plan of the Green Designer.