TEN shades of GREEN

ARCHITECTURE AND THE NATURAL WORLD

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1 LOW ENERGY/HIGH PERFORMANCE

Achieved by making maximum use of natural light and ventilation as well as by using sunshades and/or light shelves, insulation and multi-layered façades and roofs, appropriate thermal inertia (high in temperate climates, low in tropical), solar heating, evaporative cooling, water chilled ceilings, displacement ventilation in tall volumes and the redefinition of comfort standards.

2 REPLENISHABLE SOURCES

Buildings as well as power plants can harvest the non-depletable ambient energies of the sun, wind, waves, gravity and geo-thermal power. Build with constantly replenished materials, such as wood, or near inexhaustible ones, such as clay (for brick) and sand (for glass).

3 RECYCLING: ELIMINATING WASTE AND POLLUTION

Reuse old building materials, design buildings that are easily reused and build them with easily reused materials and components. Recycle water and heat. Avoid materials that are toxic in use or manufacture, or need to be cleaned with toxic materials.

4 EMBODIED ENERGY

With energy efficiency, embodied energy becomes increasingly significant in relation to life-time energy use. The material with lowest embodied energy is wood, then brick, and that with most embodied energy is aluminum.

5 LONG LIFE, LOOSE FIT

Built with materials that endure and improve with age, green buildings not only accommodate change easily but are relatively timeless and pleasant in character so that people prefer to conserve them.

6 TOTAL LIFE CYCLE COSTING

Accounts for more than initial capital costs, to include running and wage costs. Also looks at costs to environment and society of all aspects of the building, right from extracting the materials to their eventual degradation back to earth.

7 EMBEDDED IN PLACE

Green buildings fit seamlessly into, help reintegrate and minimize negative impacts upon their settings. Depending on the projects, drawing on local wisdom and updating the vernacular, or using scientific surveys and predictive computer modelling, are equally appropriate approaches to achieving this.

8 ACCESS AND URBAN CONTEXT

To be green, a building must be close to public transport and other quotidian uses. Achieving a green built environment will involve rethinking not just buildings, but cities and other forms of human settlement.

9 HEALTH AND HAPPINESS

Natural light, fresh air and absence of toxic materials and off-gassing combined with the contact with outdoors and community life makes occupants of green buildings healthy and happy. This leads to diminished absenteeism and staff turnover as well as increased productivity.

10 COMMUNITY AND CONNECTION

To help achieve a sustainable culture, green buildings must regenerate a sense of community and connection with the natural world thus giving a sense of belonging and chance to discover one's deeper self in opening up to others and the cosmos.

4 EMBODIED ENERGY

Buildings not only use energy, it also takes energy to make them. This energy is embodied energy, which is all the energy required to extract, manufacture and transport a building's materials as well as those required to assemble and 'finish' it. As buildings become increasingly energy efficient, the energy required to create them becomes proportionately more significant in relation to that required to run them. This is particularly true because some modern materials, such as aluminum, consume vast amounts of energy in their manufacture.

The building material with least embodied energy is wood, with about 640 kilowatt-hours per ton (most of it consumed by the industrial drying process, and some in the manufacture of and impregnation with preservatives). Hence the greenest building material is wood from sustainably managed forests. Brick is the material with the next lowest amount of embodied energy, 4 times (X) that of wood, then concrete (5X), plastic (6X), glass (14X), steel (24X) and aluminum (126X). A building with a high proportion of aluminum components can hardly be green when considered from the perspective of total life cycle costing, no matter how energy-efficient it might be.

From the perspective of embodied energy, every building, no matter what its condition, has a large amount of energy locked into it. This is yet another factor in favor of conserving and restoring old buildings, and for designing long life, loose fit buildings that easily accommodate change. Also, because the energy used in transporting its materials becomes part a building's embodied energy, this is an incentive to use local materials thus helping the building to be embedded in place.

5 LONG LIFE, LOOSE FIT

As well as conserving nature and energy, green design is concerned with conserving old buildings, and with new buildings that lend themselves to being conserved. There are several reasons for this, including conserving the embodied energy in the building fabric and increasing the financial returns on the initial investment. It also prevents unnecessary disruption of the neighborhood, allowing buildings to settle into place, patinate and mellow with time, become embedded in vegetation and accumulate associations in the memories of those who come in contact with them. Also, designing such buildings forces architects to think long term about the legacy to future generations, and to transcend the utilitarian and the fashionable to consider how to make buildings that will always be cherished, that people will identify with and always wish to reuse and conserve.

It is in large part because historic buildings were conceived in such terms that they are so treasured today. Most historic buildings are proving more adaptable to reuse than buildings from the recent past. This is because the older buildings were not built to minimal space standards and ceiling heights; and they avoided the debilitating extremes of either being tightly tailored to function and the mechanical equipment that serviced them, or of being quite without character so as to be totally flexible. In today's parlance, they are long life, loose fit (and the latter is not the same as no fit). They were also built with materials that lasted and even improved visually and in tactility with age.

Green buildings should thus also be long life, loose fit: generously accommodating and generic in organization so as to adapt to, yet set a dignifying framework for, change over the generations; hospitable and socially convivial rather than merely utilitarian; pleasant in character and relatively timeless rather than saddled with gratuitous gestures that quickly become passé. And they would be largely made with robust materials that mellowed with age and weathering, as generally do those with low embodied energy and from replenishable sources, or those that are virtually inexhaustible. A good example of such architecture is the Jubilee Campus.

6 TOTAL LIFE CYCLE COSTING

Green thinking takes the long-term view and looks at the