

Plenum 4: Space and Identity

The Ecological Design of Large Buildings and large Sites

26.07.2002
KEN YEANG

The paper contains a set of propositions for the design of the skyscraper and other intensive building types as ecologically-responsive buildings.

Keywords: Ecological Design, Bioclimatic, Building Configuration, Natural Ventilation, Passive Low-Energy, Sunpath, Roofscape, Vertical Landscaping, Materials, Waste, Ecosystems.

ABSTRACT

Already well-argued elsewhere is the case for architects and engineers to design our man-made environment to be sustainable or 'green' (or ecologically-responsive) design objectives if simply stated here, are to build with minimal impact on the natural environment, to integrate the built-environment with the ecological systems (ecosystems) of the locality and if possible, to positively contribute to the ecological and energy productivity of the location. For many designers today, these objectives are regarded as given pre-requisites for all their design endeavours.

The proposition here, of the skyscraper as an ecologically-responsive building might well be regarded by some as a conundrum. Afterall, the skyscraper is one of the city's most intensive building-type (besides say, the shopping mall or the convention centers). Such buildings, in comparison to those other considerably smaller experimental low-energy ecological buildings built elsewhere, are by all means and purposes not low-energy nor self-evidently ecological building types by virtue of their enormous size and high consumption of energy and materials.

The point then is that regardless of whether we are for or against intensive urban buildings such as the skyscraper, in reality this is a building type that will not simply go away. Current trends in fact, indicate that the skyscraper as a building type shall continue to be built into the next millennium and to be in existence in most of the world's cities. This condition shall likely remain until we invent another economical alternative, or until radical changes are effected in planning administration or to the current high trend of rural-to-urban migration into our cities, especially in Asia.

The pressing key issues then is how the designer today can design these massive building types to be ecologically-responsive way? This issue has to be urgently addressed immediately. For otherwise, the alternative would be a situation where our rapidly developing cities continue to be covered with multitudes of high-energy consuming, polluting-waste-producing intensive buildings. Our efforts should be urgently directed to designing ecologically-responsive skyscrapers and other intensive building types to reduce the aggregate negative impacts on the biosphere.

In this paper, the key factors for the green design of the skyscraper (and other intensive building types) are explained in the form of a simple General Systems model of the crucial interactions that any built system will have on the natural environment. As a model for design, it provides a check of the items to be considered if design is to be regarded as ecological. Illustrated are a number of built and designed precedents, using a case-study to explain the set of design principles and ideas for the ecological design of tall building.

Specifically, the paper discusses the ecological benefits of the following: passive low-energy strategies and related bioclimatic design principles as a sub-set of ecological design (such as principles on the location of the service-cores, natural ventilation of spaces, orientation of builtform, building configuration options, sunshading, wind-scoops, atriums, skycourts, etc.), the use of transitional spaces, façade design, roofscape design, building M&E Systems design, wind and natural ventilation, natural light and lighting systems, vertical landscaping, energy embodiment in buildings (primary and delivered), materials strategy (reduce, reuse, recycling, reintegration, etc.), urban design implications, life-cycle impacts, etc.