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"Toward Sustainable and Green Design of Health Care + Hospital Facilities: Case Studies"

by

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"Sustainability - Development that meets the needs of the present without compromising the ability of future generations to meet their own needs” - The World Commission on Environment and Development, The Brundtland Commission, 1987

* Introduction, Issues, and Background
The population of our planet will grow from 6.91 billion people today to over 9.19 billion in the year 2050. (Wall St. Journal 2008) Thus the demand on scarce and finite resources will intensify, and will require new and innovative ways of accomplishing more with a lot less. The earth will have to sustain billions of additional people, without being able to add non-renewable resources.

* Objective of Article
The objective of this article is to discuss basic information resources and principles of "Sustainable Design of Health & Hospital Facilities, and Present Selected Case Studies including Facilities for the Elderly.”

* The World Wide Demand for Access to Quality Affordable and Accessible Health Care
Populations will have ever more sophisticated demands for comprehensive health care. Costs of health care will continue to rise dramatically, and become growing segments of national and local budgets. The percentage of aging people within the total population will increase, thus necessitating fundamental shifts in thinking, demands, and priorities.

* Healthy Environments and Healthy Cities
The worldwide drive to make our cities and urban sprawl healthier will continue. China has in recent years focused on "Healthy Cities" initiatives. The authors have had the honor of being invited to speak at a joint international
conference sponsored by Tsinghua University and Texas A&M University in Beijing on design of "Healthy Cities."

Air and water quality, pedestrian walking opportunities, transportation and recreation were critical factors in urban design for healthy cities that were discussed at this meeting.

* **Buildings Are Part of the Problems of Sustainability**

“Buildings account for:

- 65.2 of total U. S. electricity consumption,
- 30% of total U. S. greenhouse emissions,
- 136 million tons of construction and demolition waste in the U.S.,
- 12% of potable water use in the U. S. and,
- 40% of raw materials used globally.” “**U.S. Green Building Council**”

* **Health and Hospitals**

Within this overall context we will need to conceive, think, finance, design and operate health care and hospitals in fundamentally different ways. Integrated approaches to analyzing the incidence, causes and treatment of diseases, as well as demographic trends will form the underlying premise and purpose of any new construction. Education of the public is vital and needs to be emphasized and stepped up. Education is key to prevention of disease.

Interdisciplinary approaches to prevention, early detection, early treatment of disease, and comprehensive follow up, and rehabilitation will be further developed. Ease of access to quality health care and ease of transportation for patients seeking medical care will be vital. There will have to be much closer collaboration between public health and medical experts together with urban planners, architects, landscape architects and builders. New health facilities will be part of the overall disease fighting strategy. Health resources including manpower and expensive technology will be strategically aligned for maximum efficiency and benefit.

No longer will it make sense to throw up buildings randomly. Health facilities will be part of **integrated and comprehensive health networks.** These networks will include primary care and neighborhood centers, health centers in schools, community ambulatory care facilities, community hospitals, large medical centers, and specialty hospitals (heart, cancer, children’s hospitals), as well as Centers of Excellence.

Designing for **sustainability and green architecture** will be fundamental and universal in the context of rising demands and overall limited resources in
general - and health care resources in particular.

* The state of the art of "Design for Sustainable and Green Design for Health Care and Hospitals Facilities"

The building industry itself is one of largest contributors to greenhouse gases. Fundamental and comprehensive rethinking of approaches to where, how and with what, we build is occurring.

* Selected Resources Available for Sustainable Design:

- US Green Building Council and LEED

  It is the building industry's most recognized consensus-based rating system that offers a respected third - party certification of a project's environmental achievements" (Sustainability and Health by Design, by Kirk Teske, AIA, LEED AP and George J. Mann, AIA, Medical Construction and Design, March / April 2007 pp 32 - 38)

- Green Guide for Health Care
  Another valuable tool is the Green Guide for Health Care. (www.gghc.org) The GGHc is the first quantifiable sustainable design toolkit specifically tailored for the healthcare sector.

- Sustainable Health Care Architecture
  by Robin Guenther and Gail Vittori, Wiley Publishing, - is also an excellent resource. "This is a very important book. The authors document a change in the profession that is as remarkable as it is swift-paced, because they present eloquent examples of sustainable architecture thriving in environments where it has the potential to do users the most good. Equally important, the book embodies the integrated, collaborative practice that makes green architecture possible, both in the presentation of the buildings and the book itself. Sustainable Healthcare Architecture is well documented, well written, well indexed, and well edited. It’s also well illustrated, albeit in black and white, and with its 16-page four-color signature as a visual treat..." (AIArchitect, January 2007)

* Basic Design Elements and Considerations for Sustainable Architecture: Climate
  Understanding and comprehending the year round climate is essential.
**- Site Planning, Orientation and Design**
The thought given to how a building is to be oriented on a site is a basic key to sustainable design. Design issues are sun angles, topography, landscaping, natural ventilation where practical and possible, sun overhangs, opportunities for courtyards, and outdoor spaces. In the future we will develop buildings that respond to the changes in the surrounding environment much as plants and flowers do as night follows day and as the seasons change.

**- Materials and Methods of Construction**
Utilizing local materials and methods of construction can save on expensive, unnecessary and wasteful transportation fuel and costs, as well as create local jobs. Basic decisions of the color of the materials of a building can affect heat absorption or reflection of the sun's rays.

**- New Techniques and New Technology to Enhance Sustainability**
Solar collectors, wind turbines, and efficient HVAC systems can enhance sustainable design. For example, "At the Desert Architecture Unit, Ben-Gurion University of the Negev, Professors Yair Etzion and Evyatar Erell undertook a research project featuring an innovative glazing system that converts short-wave solar to convective heat and long-wave radiation, that in turn, reduces heat and long-wave radiation that in turn reduces energy consumption. While maintaining all of the benefits of a direct solar glazing, it reduces glare, minimizes fading and reduces the problem of hot spots. The group experimented with a rotating Trombe wall system that absorbed radiant heat during the day and rotated at night to face inward, allowing the interior to use the heat collected during the day for heating the space during the cold nights. The result was energy cost savings during the summer and winter months. This concept opens tremendous possibilities for the design of hospital exteriors that would actually reduce energy costs and make hospitals more sustainable. "Designing Hospitals for Intense Climatic Conditions", by Ronald L. Skaggs, FAIA, Joseph G. Sprague, FAIA, and George J. Mann, AIA, Medical Construction and Design, March / April 2009, pp 54-58.

* **Life Cycle Costs of Building and Operating Health Care Facilities**
More attention must be paid to designing healthcare facilities and hospitals so that they are not only cost effective to build, but cost effective to operate over the life of the building. Significant percentages of operating costs go to energy and staffing costs. Design innovations that reduce energy consumption, labor, and manpower costs - over the life of the building will be key elements toward sustainable design of healthcare and hospital facilities.

* **Utilization of Environmentally Friendly, Recyclable and Reused Materials**
This approach is "key" to achieving green and highly sustainable facilities. For
instance, approximately 47,000 tons of existing (abandoned airport) runway asphalt base material was recycled and re-used on site (of the Dell Children's Medical Center of Central Texas in Austin) which reduced construction waste normally diverted to landfills." - *Green Building: Truly Groundbreaking - Dell Children's Medical Center of Central Texas*” by Joe Kuspan, AIA, Senior Vice President, Director of Design, Karlsberger and George J. Mann, AIA, Medical Construction and Design, September October 2007 pp 34 - 38

* Case Studies of Large Health + Hospital Facilities + Facilities for the Elderly:

- National and International Projects by HKS, Advisory Teaching Firm to the Texas A&M "Architecture for Health" Program

- National and International Projects by "The Architecture for Health Program" at Texas A+M University on a national and international level

* Opportunities for Future Collaboration between China and the USA
The expertise in China and the USA complement each other. Both societies have a great deal to offer one another that will result in improved sustainable health and hospital facilities.

This collaboration needs to be interdisciplinary and involve the universities in both countries, design institutes in China and the architectural/ engineering firms in the United States.

* Summary & Conclusion
Population increases, climate and environmental issues, incidence and causes of illness and death, rising costs of delivering comprehensive and accessible health care, rising fuel costs, and rising expectations of the general public are all factors combining and converging to making the years ahead challenging; and, that will require focused ingenuity and innovation on an unprecedented scale.

* About the Authors
Ronald L. Skaggs, Joseph G. Sprague, and George J. Mann are authors of this article. They are all experts in their fields and have contributed significantly to the field of healthcare architecture.

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