

Green Buildings

Pollution Prevention Workshop for the Healthcare Industry

Honolulu Shriners Hospital
July 8th & 9th, 2004

*There's an intrinsic relationship between the
built environment and ecological health*

AGENDA

- What is sustainable design
- Overview of sustainable solutions costs
- Sustainable solutions, by example
- Metropolitan Hospital Case Study
- Green Healthcare Guidelines
- Resources

Sustainable Design is going Mainstream

A recent International Facility Management Association (IFMA) survey found:

- 95% of facility managers believe that sustainability will become an important issue for the facility management profession.
- 69% of respondents are implementing green building concepts.
- 58% use or plan to add environmental criteria to vendor and product selection.

DEFINING SUSTAINABILITY

“Development that meets the needs of the present without compromising the ability of future generations to meet their own needs.”

~ Brundtland Commission, 1987



SUSTAINABLE ARCHITECTURE

- To design, construct and operate buildings to:
- Reduce negative impact on the environment
- Improve the health and comfort of building occupants
- Reduce operating costs, while improving building performance

ENVIRONMENTAL COSTS OF BUILDINGS

- \$: Increase landfill & disposal fees, cost of purchasing land
- \$: Increase operating costs
 - \$: Increase in costs of water due to limited availability
 - \$: Increase cost of electricity & mitigating air quality problems
- \$: Lost productivity costs billions of dollars/year; lawsuits

BENEFITS of SUSTAINABLE DESIGN

- Reduced environmental impact
- Reduced operating & maintenance costs
- Enhanced productivity/Reduced absenteeism
- Increased patient/occupant satisfaction
- Improved retention
- Reduced liability
- Enhanced community image

Does Sustainable Design Cost More?

- No Cost Solutions
- Life-Cycle Cost Effective Solutions
- Added Cost Solutions with no acceptable payback

NO COST SOLUTIONS

- Recycled-content products
- Low emitting materials such as paints and adhesives
- Indigenous vegetation
- Elimination of unnecessary materials



LIFE-CYCLE COST EFFECTIVE SOLUTIONS

Paying more up-front to save \$ in the long-run

- Energy Modeling
- Building envelope enhancements (e.g.: window glazing or insulation)
- Occupancy sensors
- Epoxy flooring



Boulder Community Hospital

ADDITIONAL COST SOLUTIONS

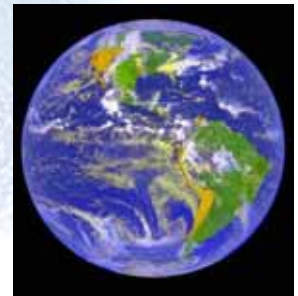
- Photovoltaics
- On-site wind generation
- Rainwater catchment
- Roof garden



⌘: Possible non-measurable benefits!

SUSTAINABLE DESIGN PRINCIPLES

- Sustainable Sites
- Water
- Energy & Atmosphere
- Materials & Resources
- Indoor Environmental Quality



SUSTAINABLE SITES: Minimize negative impact of site design

- Metropolitan Hospital; Grand Rapids, Michigan
- Shaded parking lots
- Vegetated Roof
- Constructed wetlands for stormwater management



WATER: Protect and Conserve Water

- Sample solution:
Collect and use rain water for irrigation
- McKinney Office Building; McKinney, Texas
 - Four cisterns hold 10,000 gallons each



ENERGY USE: Design for efficiency

- Optimizing use of natural light
- Utilize dimming control system to reduce use of artificial light



Ft. Riley
Medical Clinic;
Kansas

ENERGY USE: Consider Alternative Fuel

- Fuel Cells
- Efficient
 - Clean
 - Reliable
 - Federal rebates available



Kaiser Permanente;
Sacramento, CA

MATERIALS: Consider life-cycle impacts

- Mayo Clinic; Rochester, MN
- Use of Linoleum
 - Natural material
 - No off-gassing
 - Biodegradable



Sustainable Materials: Epoxy Flooring

- Water based - minimal VOCs
- Durable, 20 years + life span
- Highly stain & water resistant
- More easily repairable than
 - vinyl or nylon
- Good slip resistance chars.

Life Cycle Cost Analysis of Floor Covering Materials in Operating Rooms

<i>Floor Material</i>	<i>Initial Cost (per sq. ft.)</i>	<i>Life Span of Material</i>	<i>Cost per Year per sq. ft.</i>
<i>Sheet Vinyl</i>	<i>\$5.30</i>	5 years	\$1.06
<i>Epoxy Aggregate</i>	<i>\$6.50</i>	15 years	\$.43
<i>Epoxy Aggregate w/ waterproofing</i>	<i>\$9.25</i>	15 years	\$.62
<i>Terrazzo</i>	<i>\$11.00</i>	20 years	\$.55

INDOOR ENVIRONMENTAL QUALITY: Enhance health & comfort of building occupants

Patient Access to Daylight & Views
Boulder Community Hospital



MARKET TRANSFORMATION: DensArmor

- Georgia Pacific, Hensel Phelps, DoD and HDR Sustainable Design Services (SDS) collaboration
- Georgia Pacific developing mold resistant wallboard products - no marketing strategy
- Pentagon interested since 9/11 caused significant water damage from sprinklers and eventual mold infestations
- HDR SDS brought these parties together
- Result: The Pentagon is now using DensArmor in high-risk locations in the Pentagon and Georgia Pacific introduced the first mold resistant gypsum



MOLD-RESISTANT PRODUCT EXAMPLES

- Ecophon – high performance ceiling panel with 70% recycled content
– www.ecophon-us.com
- Eurostone - manufactured from expanded volcanic perlite, ceramic clay and inorganic binders; non-combustible, will not give off toxic smoke; unaffected by water or high humidity
– www.chicago-metallic.com



Case Study: Metropolitan Hospital Health Care Village



Grand Rapids, MI

- **Square Footage:**
370,000 SF
\$87 million
- **HDR Responsibility:**
Full AE Services
- **Building Components:**
- New hospital with 208 licensed beds located on a 170-acre site.
- LEED Registered Project

METROPOLITAN VEGETATED ROOF



**METROPOLITAN HOSPITAL:
Low-Flow Fixtures and Waterless Urinals**

www.waterless.com;
www.falcon.com

- Waterless urinals save 1 gallon/flush
- No additional cost
- Operating costs approx. \$1/1000 uses
- Savings from eliminating flush valve repairs, overuse of water, urinal screens blockages



**METROPOLITAN HOSPITAL
Reduction of Polyvinyl Chloride (PVC)**

- Piping
 - Cast iron, steel, concrete vitrified clay, and plastics such as HDPE
- Roofing Membranes
 - TPO, EPDM, FPO, MBM, NBP
- Flooring & Carpet
 - Linoleum, bamboo, ceramic tile, carpeting with natural fiber backing or polyolefins, reclaimed or FSC wood, cork, recycled rubber, concrete

**METROPOLITAN HOSPITAL:
Reduction of Polyvinyl Chloride (PVC)**

- Wall Coverings & Furniture
 - Natural fibers such as wood and wool, polyethylene, polyester and paint
- Windows & Doors
 - Recycled, reclaimed or FSC certified sustainably harvested wood, fiberglass, and aluminum.

<http://archive.greenpeace.org/toxics/pvcdatabase/index.html>

**METROPOLITAN HOSPITAL:
Use of Low-Emitting Materials**

- Common VOC sources
 - housekeeping and maintenance products
 - building and furnishing materials
- Associated issues
 - eye, nose, and throat irritations
 - headaches, dizziness,
 - visual disorders,



No/Low Volatile Organic Compound (VOC) paint

Forest Stewardship Council (FSC)



an independent, membership-based organization that brings people together to promote responsible management of the world's forests through developing standards, a certification system and trademark recognition.

METROPOLITAN HOSPITAL: FSC Wood Door Example



Typical wood door: \$200.00

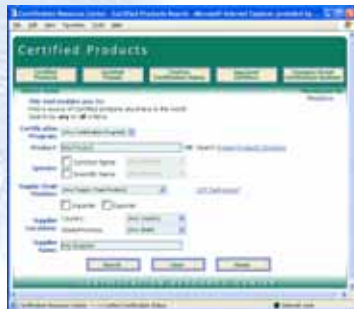
- FSC wood door:
- \$220.00
- 10% premium
- Metro Hospital = \$250,000 premium
 - Owner installed for LEED credit & because of hospital's environmental mission

<http://www.fsc.org/fsc>

Forest Certification Resource Center

www.certifiedwood.org

- EcoTimber Flooring
- Neil Kelly Carpentry
- Marshfield Door Systems
- Architectural Forest Enterprises Walls & Paneling



Metropolitan Hospital Energy Efficiency

- On-site generation at an efficient central plant
- Additional \$500,000 was spent on a more efficient mechanical system
- After 7 years, annual savings will exceed \$70,000

METROPOLITAN HOSPITAL: IEQ

- Patient control of temperature and airflow
- Access to natural light and views
- Green housekeeping
- Use of patient gardens

SUSTAINABLE HEALTHCARE RESOURCES

- Hospitals for a Healthy Environment
– h2e-online.org
- Healthcare Without Harm
– noharm.org
- Sustainable Hospitals
– sustainablehospitals.org
- CleanMed – Sustainable Tracks
– cleanmed.org



- Self-assessing Rating System
- New construction, major renovation, and built projects
- Commercial, institutional & high rise residential
- Evaluation of whole building performance
- Evaluates and recognizes performance in accepted green design categories

GREEN GUIDELINES for HEALTHCARE CONSTRUCTION



- Self-certifying metric tool
- For designers, owners, and operators
- Used to evaluate progress towards high performance healing environments
- Based on LEED
– Some credits are changed, some have been added

GGHS SAMPLE RECOMMENDATIONS



- Sustainable Sites
 - Connection to the natural world: places of respite
- Water
 - Pharmaceutical waste discharge
- Energy
 - Medical Equipment Efficiency

GGHS SAMPLE RECOMMENDATIONS



- Materials
 - Environmentally Preferable Purchasing – Organic Food
- Environmental Quality
 - Acoustics
- Integrated Design & Operations
 - Environmental Health Mission Statement & Program