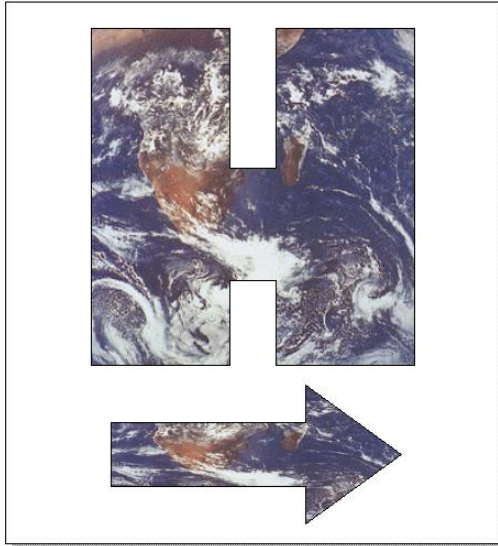


Case Studies Overview

HEALTHCARE - TOP 5 GREEN BUILDING STRATEGIES

EPA Publication 909-F-07-001



U.S. EPA's Pacific Southwest Regional Office collaborated with green building experts across the United States as part of a "*Building Healthy Hospitals*" project. Under this initiative, the project team surveyed architects, designers, engineers, and healthcare professionals to identify the "Top 5 Green Building Strategies for Healthcare" that support JHACO environment of care objectives and best combine: (a) enhanced community reputation, (b) benefits to the environment, patients and staff, and (c) cost competitiveness.

The project team conducted a literature review of green building publications, articles, factsheets, and websites; solicited input from the *Building Healthy Hospitals* Technical Advisory Group (TAG) convened for this project; collected information from conferences on Green Building and Green Healthcare; conducted interviews with leading practitioners in green building; and reviewed healthcare case studies and selected the following **Top 5 Green Building Strategies for Healthcare**:

#1: Energy Efficiency—Integrated Design and HVAC Systems

#2: Process Water Efficiency

#3: Sustainable Flooring Material Selection

#4: Indoor Air Quality: Materials Selection

#5: Lighting Efficiency—Optimizing Artificial and Natural Lighting

Case Studies Facilities:

- Emory University
- Kaiser Permanente
- University of Florida
- Discovery Health Center

The following table summarizes the benefits and case study results for each of the five green building strategies.

There are 5 *Building Healthy Hospitals* case studies developed by EPA's Pacific Southwest Regional Office, with Resource Conservation Challenge and Pollution Prevention funds.

www.epa.gov/region09/waste/p2/projects/hospart.html

Indoor Air • Sustainable Flooring • Process Water Efficiency • Lighting Efficiency • Energy Efficiency



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HEALTHCARE - TOP 5 GREEN BUILDING STRATEGIES

STRATEGY #1: ENERGY EFFICIENCY—INTEGRATED DESIGN & HVAC SYSTEMS	
Benefits	
<ul style="list-style-type: none"> <input checked="" type="checkbox"/> Community Reputation <input checked="" type="checkbox"/> Environmental/Staff/Patient Benefit <input checked="" type="checkbox"/> Cost Competitive 	<ul style="list-style-type: none"> ▪ If promoted as part of an environmental outreach program, can enhance the reputation of the organization including public's increasing concern with global warming. ▪ Energy efficiency counteracts continually increasing energy costs; HVAC energy efficiency projects can improve the facility's overall operational efficiency. ▪ Integrated design lowers HVAC size and rating and results in less intrusive indoor environment for patient and staff.
Case Studies	
<ul style="list-style-type: none"> <input checked="" type="checkbox"/> Emory University <input checked="" type="checkbox"/> University of Florida <input type="checkbox"/> Kaiser Permanente <input checked="" type="checkbox"/> Discovery Health Center 	<ul style="list-style-type: none"> ▪ Emory University: Installed Low-Emissivity (Low-E), high performance windows. Realized a 42% reduction in energy consumption for space cooling from high-efficiency chillers and a 48% savings in cooling tower energy. ▪ University of Florida: Heat from the building is captured through the chiller system, minimizing boiler operation; a ventilated "attic" space, high performance glass, and brick façade reduce the building's heat gain. ▪ Discovery Health Center: Designed non-combustion, all electric building supplied by wind power. Focused on building envelope design because it had the largest effect on the building's overall energy efficiency. Installed an efficient geothermal radiant floor heating system dramatically improving the efficiency of the facility's HVAC system. Encountered challenges with the air exchange system requirements and energy use.
STRATEGY #2: PROCESS WATER EFFICIENCY	
Benefits	
<ul style="list-style-type: none"> <input checked="" type="checkbox"/> Community Reputation <input checked="" type="checkbox"/> Environmental/Staff/Patient Benefit <input checked="" type="checkbox"/> Cost Competitive 	<ul style="list-style-type: none"> ▪ If promoted as part of an environmental outreach program, can enhance the reputation of the organization. ▪ Process water represents the largest component of facility water use; water efficiency improves long-term facility operational efficiency; proven technologies available and well-tested.
Case Studies	
<ul style="list-style-type: none"> <input checked="" type="checkbox"/> Emory University <input type="checkbox"/> University of Florida <input type="checkbox"/> Kaiser Permanente <input type="checkbox"/> Discovery Health Center 	<ul style="list-style-type: none"> ▪ Emory University: Installed condensate water recovery equipment on air handling unit cooling coils and used it as make-up water for the cooling towers, saving 900,000 gallons annually. ▪ Emory University: Reused water from the chilled water loop serving air handling units to cool compressors used to chill 9 70-100 square foot walk-in refrigerators in laboratories, saving 11.8 million gallons annually with a payback of 7.5 months.



Case Studies Overview

HEALTHCARE - TOP 5 GREEN BUILDING STRATEGIES

STRATEGY #3: SUSTAINABLE FLOORING MATERIAL SELECTION	
Benefits	
<ul style="list-style-type: none"> <input checked="" type="checkbox"/> Community Reputation <input checked="" type="checkbox"/> Environmental/ Staff/Patient Benefit <input checked="" type="checkbox"/> Cost Competitive 	<ul style="list-style-type: none"> ▪ Sustainable flooring reduces impact to the environment and building occupants of purchasing new or replacement flooring material. ▪ Some environmentally preferable flooring materials may offer reduced slip-trip-and-fall incidents or easier lifetime maintenance, improving employee satisfaction and reducing long-term costs associated with its use. ▪ If promoted as part of an environmental outreach program, can enhance the reputation of the organization.
Case Studies	
<ul style="list-style-type: none"> <input checked="" type="checkbox"/> Emory University <input checked="" type="checkbox"/> University of Florida <input checked="" type="checkbox"/> Kaiser Permanente <input checked="" type="checkbox"/> Discovery Health Center 	<ul style="list-style-type: none"> ▪ Emory University: Installed recyclable carpet tiles. ▪ University of Florida: Purchased low-emitting carpets and linoleum. ▪ Kaiser Permanente: Prepared extensive internal analysis of resilient flooring. ▪ Discovery Health Center: Used linoleum (low-VOC) and non-vinyl carpets (some cases used hog's hair). Heated sidewalks reduce salt used in winter, preventing excessive wear on flooring materials as well as water pollution.
STRATEGY #4: INDOOR AIR QUALITY: MATERIAL SELECTION	
Benefits	
<ul style="list-style-type: none"> <input checked="" type="checkbox"/> Community Reputation <input checked="" type="checkbox"/> Environmental/ Staff/Patient Benefit <input checked="" type="checkbox"/> Cost Competitive 	<ul style="list-style-type: none"> ▪ Careful material selection can improve indoor air quality (IAQ) by reducing contaminants from materials and adhesives during and after construction. ▪ Use of environmentally preferable materials and unfinished surfaces can reduce need for cleaning chemicals. ▪ Improved IAQ promotes community awareness, and can be promoted to patients, workers, and visitors. ▪ If promoted as part of an environmental outreach program, can enhance the reputation of the organization.
Case Studies	
<ul style="list-style-type: none"> <input checked="" type="checkbox"/> Emory University <input checked="" type="checkbox"/> University of Florida <input type="checkbox"/> Kaiser Permanente <input checked="" type="checkbox"/> Discovery Health Center 	<ul style="list-style-type: none"> ▪ University of Florida, Emory University, and Discovery Health Center did extensive work to ensure all sealants, paints, carpets, and other finishes were low-emitting to minimize building effects on IAQ.



STRATEGY #5: LIGHTING EFFICIENCY—OPTIMIZING USE OF ARTIFICIAL AND NATURAL LIGHTING	
Building Healthy Hospitals Project Objectives	
<ul style="list-style-type: none"> <input checked="" type="checkbox"/> Community Reputation <input checked="" type="checkbox"/> Environmental/ Staff/Patient Benefit <input checked="" type="checkbox"/> Cost Competitive 	<ul style="list-style-type: none"> ▪ Lighting energy efficiency counteracts increasing energy costs and improves the facility's overall operational efficiency. ▪ Maximizing natural light can improve patient and employee satisfaction. ▪ Studies suggest that patients can heal faster with access to natural light and vistas. ▪ Patient and staff control of local environment increases satisfaction and comfort. ▪ If promoted as part of an environmental outreach program, can enhance the reputation of the organization.
Case Studies	
<ul style="list-style-type: none"> <input checked="" type="checkbox"/> Emory University <input checked="" type="checkbox"/> University of Florida <input type="checkbox"/> Kaiser Permanente <input checked="" type="checkbox"/> Discovery Health Center 	<ul style="list-style-type: none"> ▪ Emory University: Increased interior windows (room-to-room) and used switches and occupancy sensors to increase lighting efficiency without increasing energy demands. ▪ University of Florida: Used II fixtures with automatic shut-off controls and occupancy sensors; integrated daylighting extensively. ▪ Discovery Health Center and Boulder Foothills Community Hospital: Emphasized strong connection to environment and extensive use of natural light.

