

# 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](http://www.epa.gov/region09/waste/p2/projects/hospart.html)

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



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VWUDWHJ \ #4 #HQUHJ \ #HIIIFIHQF \ È IQWHJUDWHG #HVLJQ # #KYDF # \ VWHP V#	
<b>Benefits</b>	
<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"> <li>▪ If promoted as part of an environmental outreach program, can <b>enhance the reputation of the organization</b> including public's increasing concern with global warming.</li> <li>▪ Energy efficiency counteracts <b>continually increasing energy costs</b>; HVAC energy efficiency projects can improve the facility's overall operational efficiency.</li> <li>▪ <b>Integrated design lowers HVAC size and rating</b> and results in less intrusive indoor environment for patient and staff.</li> </ul>
<b>Case Studies</b>	
<input checked="" type="checkbox"/> Emory University <input checked="" type="checkbox"/> University of Florida <input type="checkbox"/> Kaiser Permanente <input type="checkbox"/> Discovery Health Center	<ul style="list-style-type: none"> <li>▪ Emory University: Installed <b>Low-Emissivity (Low-E), high performance windows</b>. Realized a 42% reduction in energy consumption for space cooling from <b>high-efficiency chillers</b> and a 48% savings in cooling tower energy.</li> <li>▪ University of Florida: Heat from the building is captured through the chiller system, minimizing boiler operation; a <b>ventilated "attic" space, high performance glass</b>, and brick façade reduce the building's heat gain.</li> <li>▪ Discovery Health Center: Designed non-combustion, all electric building supplied by wind power. Focused on <b>building envelope design</b> because it had the largest effect on the building's overall energy efficiency. Installed an efficient <b>geothermal radiant floor heating system</b> dramatically improving the efficiency of the facility's HVAC system. Encountered challenges with the air exchange system requirements and energy use.</li> </ul>
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<b>Benefits</b>	
<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"> <li>▪ If promoted as part of an environmental outreach program, can <b>enhance the reputation of the organization</b>.</li> <li>▪ Process water represents the largest component of facility water use; water efficiency <b>improves long-term facility operational efficiency</b>; proven technologies available and well-tested.</li> </ul>
<b>Case Studies</b>	
<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"> <li>▪ Emory University: Installed <b>condensate water recovery</b> equipment on air handling unit cooling coils and used it as make-up water for the cooling towers, saving 900,000 gallons annually.</li> <li>▪ Emory University: Reused water from the <b>chilled water loop serving air handling units to cool compressors</b> 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.</li> </ul>



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<b>Benefits</b>	
<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"> <li>▪ Sustainable flooring reduces <b>impact to the environment and building occupants</b> of purchasing new or replacement flooring material.</li> <li>▪ Some environmentally preferable flooring materials may offer reduced slip-trip-and-fall incidents or easier lifetime maintenance, <b>improving employee satisfaction</b> and <b>reducing long-term costs</b> associated with its use.</li> <li>▪ If promoted as part of an environmental outreach program, can <b>enhance the reputation of the organization</b>.</li> </ul>
<b>Case Studies</b>	
<input checked="" type="checkbox"/> Emory University <input checked="" type="checkbox"/> University of Florida <input type="checkbox"/> Kaiser Permanente <input type="checkbox"/> Discovery Health Center	<ul style="list-style-type: none"> <li>▪ Emory University: Installed <b>recyclable carpet tiles</b>.</li> <li>▪ University of Florida: Purchased <b>low-emitting carpets and linoleum</b>.</li> <li>▪ Kaiser Permanente: Prepared extensive internal analysis of <b>resilient flooring</b>.</li> <li>▪ Discovery Health Center: Used <b>linoleum</b> (low-VOC) and <b>non-vinyl carpets</b> (some cases used hog's hair). <b>Heated sidewalks</b> reduce salt used in winter, preventing excessive wear on flooring materials as well as water pollution.</li> </ul>
VWUDWHJ \ #&7 ##IQ G R R U #D IU #T X D OIW \ ##P DWHUIDO#HOHFWIR Q #	
<b>Benefits</b>	
<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"> <li>▪ Careful material selection can <b>improve indoor air quality</b> (IAQ) by reducing contaminants from materials and adhesives during and after construction.</li> <li>▪ Use of environmentally preferable materials and unfinished surfaces <b>can reduce need for cleaning chemicals</b>.</li> <li>▪ Improved IAQ promotes community awareness, and can be <b>promoted to patients, workers, and visitors</b>.</li> <li>▪ If promoted as part of an environmental outreach program, can <b>enhance the reputation of the organization</b>.</li> </ul>
<b>Case Studies</b>	
<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"> <li>▪ University of Florida, Emory University, and Discovery Health Center did <b>extensive work to ensure all sealants, paints, carpets, and other finishes were low-emitting</b> to minimize building effects on IAQ.</li> <li>▪ Kaiser is developing specifications that eliminate harmful chemicals from entire categories of building materials including <b>moldings and paints</b>.</li> </ul>



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

