

Green Healthcare Construction Case Studies

**Continuum Center for Health and Healing
 Beth Israel Medical Center
 New York NY**

Architect **Guenther 5 Architects**, New York, www.g5arch.com
 Stage: Completed in 2000
 Description 12,000 sq ft **Full integrative care medical center**
 Construction **Interior renovation** in a multi tenant office bldg
 Info: www.healthandhealingny.org/center/center_environ.html

Key green construction elements:

- **IEQ & Materials** all interior materials screened for IAQ and environmental responsibility
 - Flooring: No PVC, Cork, linoleum, reclaimed wood, minimal carpet (recycled carpet tile and organic wool)
 - Paint: Durable, premium quality, fast-curing paints and stains were used that have low VOC content, no formaldehyde, ammonia, crystalline silica or ethylene glycol.
 - Construction Adhesives, Caulking Compound, Sealers, Cleaners: Low odor, non-toxic, water-based products that have very low VOC content, no formaldehyde and are safely applied by the installer
 - Cabinet substrates: Green medium density fiberboard (MDF) made from 100% recovered wood from old pallets, construction waste and manufacturers' outfall. No urea formaldehyde resin used in the binding.
 - Insulation: Formaldehyde free fiberglass minimum 25% recycled fiber
 - Ceiling acoustic panels: Rapidly renewable aspen fibers in nontoxic binder
 - Wall finish (toilets): recycled glass tiles
 - Furniture: eliminated formaldehyde, CFCs and VOCs, easily maintained with green cleaners, recyclable, metal casework, compostable fabrics.
 - PVC excluded from construction and furniture specs. PVC already illegal in NYC for piping and ductwork
 - HEPA air handler
 - Green cleaning service trained by designers
 - Follow up IAQ monitoring every 6 months

“Patients with environmentally induced medical problems come to the Center seeking Western and Eastern remedies. Many have multiple allergies, making it all the more critical for Guenther Petrarca to “push the envelope” of material selection in order to eliminate any substances that might aggravate a patient's health. The selection of building materials and installation methods optimize indoor air quality and environmental responsibility. Material selections—flooring, paint, adhesives, cabinet substrates—eliminate use of formaldehyde and VOCs. Carpet is scarce; major flooring materials are cork and linoleum, both natural and biodegradable products. Fabric selection focuses on recycled and compostable materials. All materials were selected to be easily maintained with natural cleaning products in order to ensure a high level of indoor air quality. “
 (ISDesignNet www.isdesignet.com/Magazine/June'00/cover.html)

The Center was Guenther's first with a client really making a commitment to IAQ. IAQ, not energy conservation was the real driver in this project. Addressing IAQ is an important part of the hospital's business plan for this integrative health care center where clients often have chronic illnesses and believe them to be environmentally related. The Center wants to be able to say there is nothing here to make your allergies worse.

**Sullivan County Diagnostic and Treatment Center (SDTC)
Center for Discovery
Harris NY**

Architect **Guenther 5 Architects**, New York, www.g5arch.com
Stage: In construction 2002, scheduled for completion in **2003**
Description: **Health center** for children with severe disabilities
Construction **New**
Info <http://www.thecenterfordiscovery.org/home.html>

Key green construction elements:

- Registered **LEED 2.0** (first LEED registered healthcare project)
- **IEQ & Materials:**
 - PVC excluded from all interiors, roofing (EPDM & metal) and piping
 - Flooring: Linoleum, Stratica, reusable carpet tile
 - Wall covering: Sisal
 - Low toxic finishes
 - Certified wood
- **Energy:**
 - Geothermal & radiant floor heat
 - Passive solar heat
 - Reflective metal cool roof
 - Daylighting with photocell sensor lighting control
 - Operable windows in every occupied space
- **Site:**
 - CSA organic farm & farmers market
 - Therapeutic riding center

**Legacy Good Samaritan Hospital
Marshall Street Addition
Portland OR**

Architect: **Johnson Design**, Portland, OR
Stage: Completed 1998
Description: **Hospital** - 10,000 sf entrance pavilion serving larger outpatient facility
Construction: **Addition**

Key green construction elements:

- **IEQ & Materials:**
 - views in and out to garden/nature connection,
 - terrazzo floors
 - low/no VOC materials,
 - no PVC in interior finishes
- **Energy:**
 - skylighting & daylighting
 - natural lighting softened & modulated by landscaping, design and manual Mecco screen
 - task lighting & step lighting
 - daylight controls
- **Site:**
 - landscape pocket "urban wildlife habitat" & healing garden courtyard
 - preserve old trees
 - IPM landscaping
 - pedestrian pathway with plant interpretation

1998 AIA Portland Architecture & Energy Design Awards Five buildings were recognized for demonstrating the integration of design and energy efficiency at the sixth annual Architecture + Energy (A+E) awards. The Marshall Street Addition at Legacy Good Samaritan Hospital received the Award for Enhancing Human Environmental and Economic Performance.

From the Portland AIA web site: "This 10,950 square foot addition remodel demonstrates "a well thought out approach to enhance the human experience...[and]...to enhance the surrounding buildings connected to it with a theatrical, yet measuring sense of arrival in a complex collection of buildings." This project makes an elegant statement for the roles of daylighting, effective electric lighting, indoor air quality, and landscape design to support the users well being." The new landscape pocket, specially designed for its healing qualities, is an "urban wildlife habitat." From the Portland Business Journal: "Johnson Design Studio Architecture ostensibly won the hospital addition award. It received honors for the way it enhances the environment. Among other things, designers chose fabrics that have low toxicity." www.aiaportland.com/ae/1998/goodsam.htm

From the Oregon Solar Energy Association's Energizer : "Johnson Design Studio Architecture's Legacy Good Samaritan Hospital's Marshall Street Addition, won for its people-friendly design and environmental improvements including the use of daylighting; less-toxic materials; improved lighting, energy and mechanical systems; and a healing urban wildlife habitat." www.solaror.org/Energizer/Aug98.htm

From Energy NewsData ""That project hit all of us as enhancing human, environmental and economic performance," said juror Gail Lindsey, an architect who is founder and president of Design Harmony. The building designers clearly looked beyond traditional architectural boundaries, Lindsey noted. For example, the project includes a healing garden enjoyed by patients as well as people in the local community. Some day it might even serve as urban wildlife habitat, further extending the context. Lindsey also lauded the project for such features as non-toxic paints and extensive use of daylighting." www.newsdata.com/enetnet/conweb/conweb31.html#cw31-4

Swindon Hospital
Swindon, UK

Developer **Carrillon**
Stage Scheduled for completion in late **2002**
Description **Full service hospital**
Construction: **New**
Info: <http://www.carillionplc.com/general-hospital/swindon/environ.htm>

Key green construction elements:

- Using **Natural Step** process in design
- **IEQ & Materials:**
 - sustainable lumber
 - reduce PVC
 - other green materials
- **Energy:**
 - solar glazing
 - effective insulation materials
 - low energy lighting
 - high efficiency HVAC equipment
- **Waste:**
 - onsite segregation of all material for recycling of pallets, plasterboard, plastic, cardboard, hard-core, arboricultural waste (green waste) and general waste
 - Green waste, lumber, paper and cardboard chipped for mulch or composted for topsoil
 - Preference to recycled and long life products
 - Preference to suppliers who take back and recycle packaging
 - Landscaping to reuse soil on site and minimize waste soil
- **Site:**
 - wildlife protection habitat management plan
 - tree planting
 - bird boxes

Mt. Sinai Medical Center
Obstetric Services – Postpartum Units (7th & 8th floor/ Klingstein Pavillion)
New York NY

Architect: **Guenther 5 Architects**, New York, www.g5arch.com
Stage: Under design in 2002, completion scheduled 2004
Description: 60 bed **OB acute care** service facility
Construction: **Interior renovation** in existing hospital

Key green construction elements:

- **IEQ & Materials:** - no PVC finish materials
 - Flooring: Fritz tile, Linoleum, Rubber and Stratica (faux wood)
 - Wall: Low VOC paint, Zirell fabric, Cherry millwork
 - Cabinet substrates: Medex formaldehyde free
 - Ceiling: Metal, wood, Armstrong acoustic ceiling tile
 - (Furniture in process)

Mt. Sinai Medical Center
Allogenaic Bone Marrow Transplant Center
New York NY

Architect: **Guenther 5 Architects**, New York, www.g5arch.com,
Stage: Completed in **1999**
Description: 4 bed **unit in Medical Center**
Construction: interior **renovation**

Key green construction elements:

- **IEQ & Materials:**
 - Material selection to minimize outgassing IAQ problems
 - No PVC in interior finish materials

"Here, seriously ill patients undergo radical treatments that leave their immune systems severely compromised. For some 45 days, patients stay in "class 100 clean rooms" while their bodies regenerate white cells and their immune systems regain strength. For this project, Guenther Petrarca needed to be absolutely certain that the materials and installation methods they chose would not adversely affect patients."
(ISDesignNet www.isdesignnet.com/Magazine/June'00/cover.html)

**University of Texas Houston
 School of Nursing
 Houston TX**

Architect: **BNIM – Berkebile**, Kansas City, MO www.bnim.com.
 Stage: Construction started in early 2002. Completion expected in early 2004.
 Description: **Medical school**
 Construction: **New**
 Info: <http://www.uth.tmc.edu/sustainability/>

Key green construction elements:

- **LEED** Registered planning for Gold (possible Platinum with future PV)
 - Innovative credits: High volume flyash, high water use reduction education program, high stormwater reduction or high recycling
- **Energy:**
 - 46% better than ASHRAE 90.1 1999,
 - high performance glazing
 - shading
 - daylighting with user/occupancy and daylighting light controls
 - task lighting
 - raised floor
 - commissioning with monitoring system for ongoing energy measurement and performance verification
 - PV infrastructure (planned future rooftop array)
- **Site/Water:**
 - Efficient landscaping
 - grey and storm water reuse for sewage and irrigation
 - green roof
 - no light trespass
 - transit access
 - bike storage and shower facilities
 - wastewater living machine (future)
 - 62% reduction over baseline projected
- **Materials/IEQ:**
 - Low VOC adhesives and finishes
 - Local sourcing (>50% <500 miles)
 - recycled content (50% of materials, incl >50% fly ash concrete),
 - leased take back carpet tile
 - >50% certified wood (interior wood doors, lab casework, cabinetry, wall ceiling panels, mesquite and bald cypress flooring)
 - rapidly renewable materials (cotton insulation, linoleum, agri-fiber boards).
 - Existing building deconstruction and recycle or reuse.
 - Demountable office/classroom partition system for future flexibility.
 - No PVC in plumbing piping (cast iron, copper, and concrete), wall covering, window treatments, carpet, resilient flooring. PVC will likely remain in wiring, slab conduit, and some F/F&E items like some furniture items and computer cabling.
- **Waste/Construction practices:**
 - Diversion averaging 80% as of fall 2003
 - IAQ management plan for construction in place.

(updated Oct 2002)

**Boulder Community Foothills Hospital
 Boulder, CO**

Architect: Oz Architecture, Boulder, CO www.ozarch.com and Boulder Associates, Boulder, CO www.boulderassociates.com
 Stage: Construction began in late 2001, and was completed in August 2003. The facility opened in September **2003**.
 Description: **Acute Care Hospital** (including Emergency Department, ICU, Surgery, Lab, Imaging, Pharmacy, Occupational Med, and Offices) 231,000 sf
 Construction Info: **New**
<http://www.bch.org>,

Key green construction elements:

- **LEED** Certified, Silver level, Innovative – CUP, Daylight harvesting, operable window HVAC interconnect
- **Site/Water**
 - Maintain wildlife corridor and sensitive to floodplain
 - Erosion control
 - Restoring wetlands for filtering storm water (with oil interceptors first)
 - Permeable pavers for fire lane
 - Near transit, added bus shelter
 - Bicycle facilities, showers
 - Reducing parking 25% beyond zoning via variance, preferred parking for carpools
 - Minimized light pollution
 - Waterless urinals and efficient sensor fixtures
 - Low water use and xeriscape plantings
- **IEQ & Materials**
 - High recycled content in concrete (fly ash), insulation, carpet, acoustical tile, structural steel, rebar, and millwork
 - High local content in concrete, stone, masonry, studs, paint & millwork
 - TPO (non PVC) roof
 - Linoleum flooring
 - Low VOC paint, carpet, adhesives; formaldehyde-free insulation, millwork and plywood
 - Operable windows in patient rooms with mechanical system interlock, views
- **Energy**
 - Efficient daylighting and electric lighting; daylight and occupancy sensors
 - Energy Star reflective roof, with high R-value (R-30)
 - Energy-efficient glazing
 - Exterior sun shading on west and south
 - Highly efficient Central Utility Plant (CUP)
 - Additional commissioning – extensive third party
 - 30% savings over LEED baseline
- **Waste/Construction practices**
 - Aggressive construction waste recycling, 64%
 - Site fill obtained for free from a nearby site that was excavating
 - LEED IAQ protocol is standard practice
 - Construction staging management and flush out period
 - New filters after flush out
- **Operations**
 - comprehensive recycling and EPP programs in place and designed for in new
- **Innovative** credits for encouragement of alternative transportation, and extremely high amounts of local and recycled content materials.

(updated September 2005)

**Fletcher Allen
Renaissance Project
Burlington, VT**

Architect: Tsoi/Kobus Boston, MA www.tka-architects.com
Stage: Construction started in 2001, completion expected in 2005
Description: **Ambulatory care** and joint **education** center (with University of Vermont)
Construction **New** 400,000 sf adjoining existing buildings
Info: <http://www.fahc.org>

Key green construction elements:

- **LEED:** registered
- **Materials/IEQ:**
 - Reducing PVC use
 - TPO E star roof
 - Low or no formaldehyde and low or no VOC indoor finish materials
- **Energy:**
 - High performance glazings
 - EE (VT one state that has active EE stds)
- **Site/Water:**
 - storm water management retainage basin & filtration
- **Waste/Construction practices:**
 - seeking a high diversion of construction and demolition diversion
- **Operations:**
 - Compost out & organic food in

**St. Francis Health System
Warren MOB Tulsa Campus
Tulsa OK**

Architect: Hammel Green Abrahamson Associates (HGA), Minneapolis, MN www.hga.com
Developer: Warren Professional Building Corp.
Stage: in design development to be completed May 2003
Description: 170,946 sf **MOB**, 6 ORs outpatient area
Construction **New**
Info: <http://www.saintfrancis.com/>

Key green construction elements:

- **LEED** Registered attempting silver, major parking deck impervious surface is challenge
- **Materials**
 - Regional sourcing
 - Recycled content
 - low/no VOC materials and finishes
- **Energy**
 - efficient HVAC
 -

Driven by concern and marketing opportunity, IAQ issues and legal ramifications

**San Francisco Department of Public Health
 Laguna Honda Hospital Rebuild
 San Francisco CA**

Architect: Joint venture of Anshen + Allen and Chong | Partners Architecture with VanderRyn Associates (LEED)
 Stage: In design development in 2002, scheduled for completion in 2007-2011
 Description: 1200 bed Long term **residential nursing** care
 Construction <http://www.dph.sf.ca.us/LHHReplace>

Key green construction elements:

- **LEED:** Registered, attempting to meet LEED Silver, Innovative: education, PVC reduction,
- **Materials/IEQ:**
 - Reducing PVC usage
 - Low VOC and other IAQ work,
 - Views
- **Energy:**
 - High performance equipment and design
 - No HCFCs or halons
 - Daylighting and controls
- **Site/Water**
 - Open space protection and restoration
 - Transit access
 - Bike facilities
 - Water efficient landscape and facilities
 - Heat island mitigation
 - Light pollution reduction,
- **Waste/Construction practices:**
 - seeking 75% of diversion
 - IAQ management plan
- **Ops:**
 - Compost
 - Organic therapy garden
 - Green cleaners

**McKenzie Willamette
 Hospital Expansion
 Springfield OR**

Architect: HDR Architects, Omaha, NE www.hdrinc.com
 Stage: On hold during organizational reorganization. Start programming in early winter 2003
 Description 90,000 sf **Hospital** expansion
 Construction Addition and renovation

Key green construction elements:

LEED: registered, possible Silver for new tower, maybe also LEED™ for Existing Buildings
IEQ & Materials: Definite PVC elimination.
 (updated October 2002)

**Heather Hill Hospital & Health Partnership
 Geauga YMCA Center for Health and Wellness
 Munson, OH**

Architect: Doty & Miller Architects, www.dotyandmiller.com
 Stage: Construction started July 2002, completion scheduled for fall 2003
 Description: 50,000 sf **Rehabilitation** health and wellness facility
 Construction **New**
 Info <http://www.heatherhill.org/ymca/>

Key green construction elements:

- **LEED** registered
- **Energy**
 - Natural day lighting
 - Geothermal ground source heat pump & HVAC system.
 - Active solar hot water heating for pool water.
 - Electrical lighting controls with daylight and occupancy sensor controls
 - High performance insulation and glazing systems
- **IEQ/Materials**
 - High indoor air quality
 - Long lasting durable natural materials
 - Materials with recycled content or from rapidly renewable sources.
 - Low VOC finishes and products

**Logansport State Hospital
 Isaac Ray Treatment Center
 Logansport, IN**

Architect Scholer Corporation www.scholer.com
 Stage unknown
 Description 66-bed **mental health treatment**
 Construction **New**

Key green construction elements:

- **LEED** registered

**Saint Mary's Mercy Medical Center
 Richard J. Lacks, Sr. Cancer Center
 Grand Rapids, MI**

Architect: Trinity Design
 Stage: Construction began 2002. Scheduled for completion in the second quarter of **2004**
 Description **Cancer Treatment facility**. 40 inpatient rooms with rooms for family members
 Construction **New**
 Info <http://www.smmmc.org/construction/>

Key green construction elements:

- **LEED** registered