BIKE TOURS OF CAMBRIDGE
EXPLORING CAMBRIDGE BY BICYCLE

THE GREEN BUILDING TOUR

SATURDAY, MAY 20TH

start: 10:00 Cambridge Common
10:30 ride starts
ends: Cambridge Police Station

ride length: 11.5 miles
ride time: approximate 2 hours

"Green" buildings of all types dot the Cambridge landscape. Companies, universities, individuals, and the city government now integrate sustainable building practices into development plans for an array of sites. Each offers slightly different aspects of green design and construction, whose key elements include:

WATER storm water and water systems	ENERGY USE heating/cooling and other	LIGHT natural lighting and efficient lights
AIR QUALITY fresh air access and low-VOC (volatile organic compound) materials	BUILDING MATERIALS renewable, recycled, etc.	TRANSPORTATION access to public transportation, bike facilities

Organized by the Cambridge Bicycle Committee
RIDE INFO: *www.cambridgebikes.org*

Planners designing green buildings often use the Leadership in Energy and Environmental Design (LEED) guidelines developed by the U.S. Green Buildings Council. Points are awarded for everything from dual-flush toilets to photovoltaic cells, and these points tally up to various levels of certification—basic, silver, gold, and platinum. However, many green buildings have been constructed in a responsible and sustainable manner outside the LEED framework

All of today's tour buildings have many green features; these descriptions highlight just some of them.

1 Harvard University Information Services
60 Oxford Street

Roofs might not be the first aspect of a building that one would consider, but they are very important because they receive most of the building's sun and rain. The 60 Oxford Street building uses two techniques for "greening" the roof. Both reduce the "urban heat island" effect: the tendency of urban areas to be hotter, creating smog and increasing energy use. The taller building's roof is white, so it reflects heat rather than accumulating heat as would a dark roof. The shorter building's roof is green. It features several trees, which slow down the water runoff and are surrounded by mulch, making irrigation unnecessary. The building's staff say, "People love it!"

2 Porter Square shopping center

Frequented by thousands of Cambridge and Somerville residents, this shopping center is a great venue for the display of solar energy power. Completed in 1999 by Gravestar, Inc., a real estate management firm with an emphasis on environmentally sensitive development, the Porter Square center incorporates a number of green practices, including 400 new trees and shrubs and a storm water collection system that uses the collected water to irrigate or allows it to seep into groundwater rather than letting it run off *[see Stata Center section for runoff info]*. However, the center's most noticeable element is the solar panels, which produce 22,000 kWh of electricity a year, offsetting 31,680 pounds of CO2—the equivalent of 14 barrels of oil.

3 Cambridge Cohousing
175 Richdale Avenue

Built in 1998, this condo development was one of the American Institute of Architects Top 10 Green Designs for that year. The future homeowners and architects worked closely on the design, specifying many green aspects. Perhaps most interesting is the innovative heating and cooling system, called ground-source heat pumps. These pumps rely on the fact that, once they are deep enough, the temperature of the earth is constant (about 50° F) despite varying air temperature. Eight 10-ton ground-source heat pumps are served by coolant from three 1,500-foot deep wells on the site. The wells contain heat exchangers that consist of liquid-filled pipes that absorb or dissipate heat into the ground. In the winter, these heat pumps remove warmth from a heat exchanger and pump it into the building. In warm weather, the process is reversed, and heat from the building is removed and transferred to the ground. Although a gas boiler is used to boost temperatures in especially cold weather, the system uses much less energy than conventional systems.

4 MIT Community Solar Power Initiative
91/93 Larch Road

The MIT Community Solar Power Initiative is funded by a generous grant from the Massachusetts Technology Collaborative (MTC). The Larch Road house's 2.18 kW system is one of a number of residential sites that comprise the project's 55 kW of community solar installations. Panels on the house's roof were installed in July 2003 and have produced a total of 5,056 kWh of energy since, with a banner month of 302 kWh in July 2005. Aside from the initial setup, no additional costs have been incurred, creating a source of free, renewable energy for this private house.

5 Pilot Sustainable Housing Demonstration Project
136 Appleton Street

This house was retrofitted in 1997 to become a model for sustainability in private residences. Homeowner Diane Cotman, who started with a 1928 Arts and Crafts house, found that a number of the older building materials were actually less toxic than some used today. One important step was to tighten up the building envelope—everything that creates a barrier between the indoors and outdoors—from foundation to walls to roof. Recycled newspaper insulation was blown into the walls, and sustainably sourced woods and wood alternatives were used to reinforce the aging timbers. The house also includes innovative water systems such as the one that takes "graywater" from tubs and sinks and filters it to water house plants.

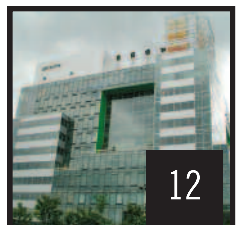
6 Union of Concerned Scientists
2 Brattle St

The Union of Concerned Scientists purchased the top two floors of this building in 1999 and worked with the designer, builder, and Cambridge City planning office to renovate and make a greener space. Perhaps the building's most striking feature is the extensive daylighting. The windows lining the building's exterior have efficient argon-filled, low-e-coated (low-emissions) double glazing. Inside walls made partially of glass pass light through to hallways and interior offices. Highly reflective acoustical ceiling tiles also help transmit reflected daylight to the interior. A central atrium/stairwell connects the two floors, bringing a flood of daylight from the large overhead skylight. Lights are also responsive to the daylight brought in and automatically adjust. Finally, solar cells on the roof supply about one-third of the energy for lighting needs during peak summer hours.

7 Harvard University Operations Services
46 Blackstone St

This green building is actually a renovation and combination of three connected buildings. The development showcases what can be done with cost-effective, sustainable design. The indoor materials are particularly interesting and minutely detailed. Bamboo flooring is used instead of wood because bamboo grows quickly, making it a more renewable resource. Linoleum in kitchen areas is made with linseed oil rather than petroleum. Carpet tiles allow for

replacement of small pieces rather than the whole floor, and these tiles have some recycled content. Paints and fabrics used indoors are low-VOC, so they give off low amounts of volatile organic compounds, which in high amounts can cause adverse health effects. Building occupants can also use water fountains with reusable cups rather than stocking a fridge with waste-creating bottled water. Blackstone is currently seeking LEED Gold certification.



8 MIT Simmons Hall
229 Vassar St

This dormitory, affectionately referred to as the Sponge, was built in 2002. Simmons dramatically cuts down on energy use through use of passive cooling systems rather than air-conditioning. Solar shading and 6,000 operable windows are part of the system that also includes low-energy-use dehumidifiers that supplement natural ventilation for especially hot, muggy days. The exterior concrete walls create are an effective thermal barrier, lessening the impact of outside air temperature conditions on indoor air. Indoors, exposed concrete cools at night because of ventilation and a large thermal lag (i.e., it takes longer to heat and cool). The walls remain cool during the day, lessening the need for added cooling.

9 23 Sidney Lofts
23 Sidney St

The 51-unit lofts are part of the larger University Park development at MIT and were built with sustainable principles in mind. The variation in the green copper walls comes from the fact that this material is 95% recycled. The green walls are matched by a green roof that reduces storm water runoff *[see Stata Center section for runoff info]*, helps with heating and cooling costs, and gives those in surrounding buildings a nicer view.

10 MIT cogeneration plant . . .

MIT makes about 80% of its energy needs at the cogeneration plant on Vassar Street. Cogeneration marries gas and electrical power in a symbiotic relationship, simultaneously making electricity and thermal power. Natural gas is used to make electricity in a combustion turbine, and the waste heat is used to generate steam for heating and operating steam turbine-driven chillers for cooling. This new technology reduces emissions by 45% over the old, and is also 18% more efficient, saving the university money and equivalent emissions of 13,000 car roundtrips into Cambridge per day.

. . . and Algae Bioreactor
41-43 Vassar St

The roof of the MIT cogeneration plant is home to millions of algae that "green" the plant even further. Installed by Cambridge-based GreenFuel Technologies, these triangular tubes full of algae and water were the first beta test of the company's patented "Emissions-to-Biofuels" process. This installation works on a small sample of emissions from the MIT plant, but it has shown results of reducing carbon dioxide and nitrogen oxide emissions by up to 85%. How does it work? Emissions air from the plant bubbles into the tubes where algae photosynthesize the carbon dioxide. Portions of this algae mixture are constantly withdrawn from the system, "dewatered," and formed into solid cakes. These cakes can then be made into various biofuels, for instance, into ethanol through fermentation. This beta test at the MIT plant has allowed GreenFuel to further its research. You can learn more at its Museum of Science exhibit!

11 Stata Center
32 Vassar St

Storm water is another major aspect of green building, and it's a highlight of the Stata Center. Builders try to prevent runoff from directly entering sewer systems or the watershed because it often contains a number of contaminants. Here, water runoff is directed toward a low point where a bioswale uses biofiltration (filtration through natural plant materials) to clean the rainwater. Some water is then recirculated by a solar-powered pump and used for irrigation and to flush toilets! In an effort to contribute to a cleaner Charles River, any water not reused on site is also filtered before entering storm water drainage pipes. Additionally, irrigation is reduced around the building through the use of weather data and rain gauges.

12 Genzyme Building
500 Kendall Street

The poster child of Cambridge green buildings, this LEED Platinum building is sited on a former brownfield and serves as a cornerstone for continuing mixed-use development of the Kendall Square area. The building was designed from the inside out, concentrating on improving quality of life (and thus productivity) of workers through green building practices. The roof features sophisticated mirrors called heliostats, which track the path of the sun and reflect sunlight onto an opposing set of mirrors that directs light into the central atrium. A chandelier of mirrors indoors further scatters natural light, and glass walls allow for passage of natural light throughout the interior. Computer-controlled blinds on the building's exterior walls track the sun and adjust their angles to let in light but deflect heat. Indoor quality of life is also improved through air quality including fresh air from 800 operable exterior windows and 18 small gardens scattered throughout the building.

13 Cambridge City Hall Annex
344 Broadway

The City of Cambridge showcases its own commitment to green buildings in this project. Originally built in 1871, the Annex was renovated in 2004 to LEED Silver standard and houses some of the most frequented city offices. Renovation to greener standards was particularly tricky given the building's historic nature. For instance, sourcing large, double-glazed windows that were mullioned was challenging. And though the building gets about 10% of its energy from solar panels on the roof, they were sited so they would not visible from the street, again to maintain the building's historic character. Of special note on this tour is the attention to bicycles: indoor bike storage and showers for bike commuters are provided. Visitors can lock their bikes at outdoor racks, and a fleet of four bikes is available for building occupants. Carpooling is also encouraged through limited parking (one space per four employees) and the reservation of two spaces for car pools.

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