RADCLIFFE INSTITUTE
FOR ADVANCED STUDY
HARVARD UNIVERSITY

GREEN
is the new Crimson

Fay House—Harvard Radcliffe
10 Garden Street, Cambridge Massachusetts
Project Profile

LEED NC v2009
Gold
May 2013

In June 2011, the Harvard Radcliffe Institute of Advanced Study began construction on the major renovation and restoration of the historic Fay House, originally built in 1807. Renovations to the building included mechanical and electrical systems upgrades, life safety and accessibility improvements, envelope restoration and modernization, deferred maintenance projects, and structural improvements. This provided Radcliffe with an opportunity to reconfigure the spaces to meet the building's evolving programmatic requirements as well as increasing energy efficiency while improving indoor air quality. To further complicate the matter, these goals needed to be achieved while preserving the building's historic features and character, inside and out.

Photo: copyright Harvard Green Building Services, 2012

Once the original site of the Radcliffe College, the building now houses the Institute's administration offices and is a contributing structure to the Old Cambridge National Register as well as the Harvard Planning Office's Inventory of Interior Spaces with Cultural, Historic, or Artistic Merit, thereby requiring significant features to be maintained throughout the construction process.

The completed project represents Harvard's commitment to preserving its history while meeting the challenges of energy conservation and modern innovation. Sustainable building systems highlights include: ground source heat pumps, LED lights and sophisticated lighting controls, materials reuse, and a focus on responsible construction practices.

LEED® Facts

Harvard University
Fay House - Harvard Radcliffe

Location	Cambridge, Massachusetts
Rating System	LEED NC v2009
Certification Achieved	Gold
Total Points Achieved	65/110
Sustainable Sites	22/26
Water Efficiency	5/10
Energy and Atmosphere	13/35
Materials and Resources	7/14
Indoor Environmental Quality	11/15
Innovation and Design	6/6
Regional Priority	1/4

Project Metrics

87% of existing walls, floors, and roof were maintained during the renovation.

35% reduction in overall water consumption as compared to EPACT 1992 baseline

97% of all construction waste and debris was diverted from land-fills.

39% salvaged, refurbished or reused materials as a percentage of total materials cost

Energy Efficiency

The Radcliffe Institute for Advanced Study at Harvard University (RIAS) has committed, along with Harvard University as a whole, to reduce greenhouse gas emissions 30% below 2006 levels by 2016, inclusive of growth. Therefore, the following energy conservation measures (ECMs) were implemented as part of the Fay House Renovation.

Mechanical Systems

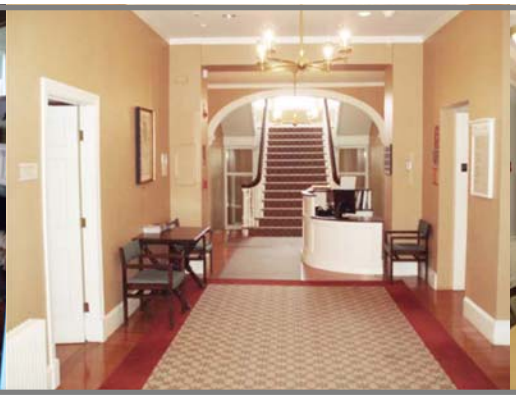
ECM 1: **Direct Digital Control Building Management System (BMS) -** The air handling unit, hot and cold water pumps, ground source heat pump system, and fan coil units are all monitored and can be adjusted by the BMS to ensure that the systems are working correctly and efficiently. In addition, the BMS monitors outdoor air temperature, RH, and CO_2 levels.

ECM 2: **Ground Source Heat Pump System** - A geothermal ground source heat pump system warms or cools the Fay House by extracting heat from or rejecting excess heat to the geothermal well water collected by five standing-column geothermal wells at Radcliffe. Taking advantage of this natural process greatly reduces operational costs.

ECM 3: **Enhanced Refrigerant Management -** Chlorofluorocarbons (CFC's), used in refrigeration equipment cause significant damage to the layer of Earth's ozone responsible for absorbing some of the sun's ultraviolet radiation. Unfortunately, an alternative for CFCs has not been developed. To that end, the refrigerants used in this project have small ozone depletion potential and small global warming potential factors in order to minimize their overall impact on the environment.

ECM 4: **Motorized Shades -** Motorized shades were installed to minimize summer heat gain in the summer. This leads to reduced operational costs associated with cooling.

Gardiner Conference Room



North Entry Foyer

Sheer Conference and Media Room

Electrical Systems

ECM 1: **Direct Digital Control Building Management System (BMS) -** The lighting and lighting controls are all monitored and can be adjusted by the BMS to ensure that the systems are working correctly and efficiently. In addition, the BMS monitors outdoor air temperature, RH, and CO_2 levels.

ECM 2: **Occupancy Sensors -** Occupancy sensors turn the lights on, or off, based on actual occupancy. This prevents energy waste from when lights are left on when the room is unoccupied.

ECM 3: **Daylight Sensors -** Daylight sensors adjust artificial lighting levels based on the amount of daylight entering the space.

ECM 4: **Reduction in Lighting Power Density -** 16% reduction in lighting power density (watts/square foot) when compared to ASHRAE 90.1-2007 baseline. Reduction was achieved through the use of LEDs, high efficiency linear fluorescent lamps and efficient fixtures.

PRODUCTS AND MATERIALS

WATER EFFICIENCT FIXTURES

43% reduction in annual water use (35,180 gallons/year) when compared to EPAct 1992 baseline standard

Smart 305 Elongated
Sydney
- ✓ Dual Flush
- ✓ **1.28/.8 gallons per flush** (gpf) vs. EPAct baseline of 1.6 gpf.

ETF 610
Sloan
- ✓ **.08 gallons per cycle** (gpc) vs. EPAct baseline of 0.25 gpf.

Evoke K-6331
Kohler
- ✓ **1.5 gallons per minute** (gpm) vs. EPAct baseline of 2.2 gpm.

LIGHTING AND CONTROLS

16% reduction in lighting power density (watts/square foot)

Damp Location Fluorescent
Lithonia
- ✓ Impact resistant
- ✓ UV-stabilized
- ✓ Reinforced polyester fiberglass housing

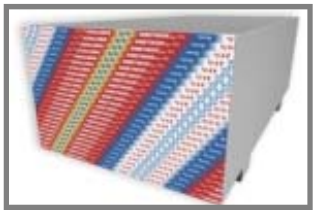
Wireless Ceiling Mounted Sensor
Lutron
- ✓ Three settings available: Auto-On/ Auto-Off, Auto-On Low-Light/Auto-Off, and Manual-On/Auto-Off
- ✓ Auto-On Low-Light feature will only turn lights on automatically if there is less than approximately 1 fc (10 lux) of ambient light

QS Sensor Module
Lutron
- ✓ Uses Clear ConnectTM RF Technology for communication with Radio Powr SavrTM occupancy sensors, Radio Powr Savr daylight sensors, Pico® wireless controllers, and motorized shades.

PRODUCTS WITH RECYCLED AND REGIONAL CONTENT

12% recycled content value as a percentage of total materials cost
28% regionally manufactured value as a percentage of total materials cost

Blown In Insulation
JohnMansville
- ✓ Recycled Content
  - 20% Post-consumer
  - 5% Pre-consumer
- ✓ Regionally Extracted/Manufactured
  - Edison, NJ - 243 miles



Firecode
USG Sheetrock
- ✓ Recycled Content
  - 20% Post-consumer
  - 5% Pre-consumer
- ✓ Regionally Manufactured
  - Danville, PA - 243 miles

ProStud Steel
ClarkDietrich
- ✓ Recycled Content
  - 26% Post-consumer
  - 6% Pre-consumer
- ✓ Regionally Extracted
  - Bristol, CT - 107 miles

Please note that while many products are described in this project profile, these are provided for informational purposes only, to show a representative sample of what was included in this project. Harvard University and its affiliates do not specifically endorse nor recommend any of the products listed in this project profile and this profile may not be used in commercial or political materials, advertisements, emails, products, promotions that in any way suggests approval or endorsement of

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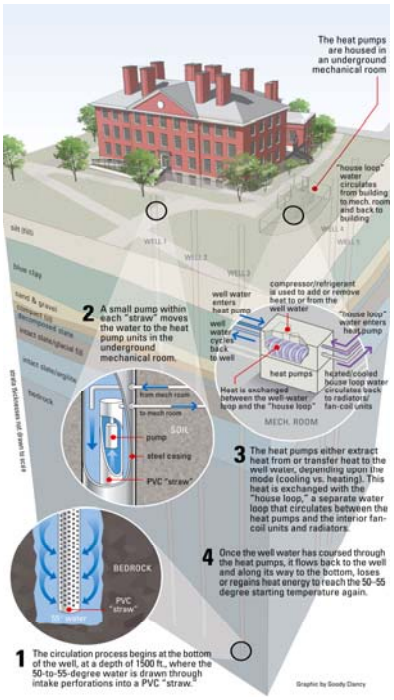
OPEN LOOP STANDING-COLUMN GEO-THERMAL GROUND SOURCE HEAT PUMP

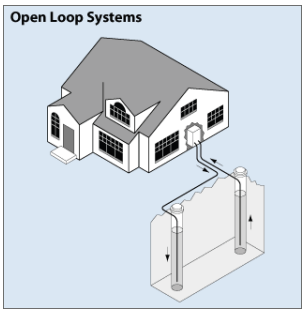
An open loop standing column geothermal ground source heat pump uses an underground water source as both the heat source and heat sink for providing both heating and cooling to the Fay House. Five standing column wells extract and return water between the 1500 feet deep wells and the heat pumps located in the building mechanical room. The heat pumps extract heat from or transfer heat to the well water, depending on heating or cooling mode. This heat is exchanged with the building loop, a system of pipes that circulates hot or cold water between the heat pumps and the terminal units located in building.

http://green.harvard.edu/sites/default/files/attachments/renewables/gshp-fact-sheet.pdf

http://www.green.harvard.edu/sites/default/files/attachments/oe/GSHPSharable3-08.pdf



Graphic: Goody Clancy, 2008



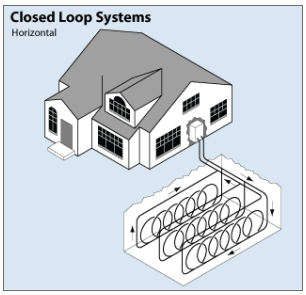


Image Source: U.S. Department of Energy (EERE Divisions)

Private Office

Photo: copyright Green Building Services, 2012

PROJECT TEAM

Owner	Harvard Radcliffe Institute
Architect	Venturi Scott Brown Associates
Landscape Architect	Stephen Stimson Associates
MEP Engineer	Cosentini Associates
Civil Engineer	Green International
Construction Manager	Shawmut Design and Construction
Commissioning Authority	Facility Dynamics Engineering, Inc.
Sustainability Consultant	Harvard Green Building Services

MORE INFORMATION

- Harvard Radcliffe: http://www.radcliffe.harvard.edu/
- Harvard Green Building Services: http://green.harvard.edu/green-building-services
- Harvard Green Building Resource: http://green.harvard.edu/theresource
- Follow Green Building Services: http://www.facebook.com/HarvardGBS or @Harvard_GBS

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HARVARD RECYCLES

LEED Certification Review Report

This report contains the results of the technical review of an application for LEED® certification submitted for the specified project. LEED certification is an official recognition that a project complies with the requirements prescribed within the LEED rating systems as created and maintained by the U.S. Green Building Council® (USGBC®). The LEED certifcation program is administered by the Green Building Certification Institute (GBCI®).

Fay House - Harvard Radcliffe

Project ID	1000008791
Rating system & version	LEED-NC v2009
Project registration date	08/19/2010

Certified (Gold)

CERTIFIED: 40-49, SILVER: 50-59, GOLD: 60-79, PLATINUM: 80+

LEED FOR NEW CONSTRUCTION & MAJOR RENOVATIONS (V2009)

ATTEMPTED: 66, DENIED: 3, PENDING: 0, AWARDED: 65 OF 110 POINTS

SUSTAINABLE SITES — 22 OF 26

SSp1 Construction Activity Pollution Prevention	Y
SSc1 Site Selection	1 / 1
SSc2 Development Density and Community Connectivity	5 / 5
SSc3 Brownfield Redevelopment	0 / 1
SSc4.1Alternative Transportation-Public Transportation Access	6 / 6
SSc4.2Alternative Transportation-Bicycle Storage and Changing Rooms	1 / 1
SSc4.3Alternative Transportation-Low-Emitting and Fuel-Efficient Vehicles	3 / 3
SSc4.4Alternative Transportation-Parking Capacity	2 / 2
SSc5.1Site Development-Protect or Restore Habitat	1 / 1
SSc5.2Site Development-Maximize Open Space	1 / 1
SSc6.1Stormwater Design-Quantity Control	1 / 1
SSc6.2Stormwater Design-Quality Control	1 / 1
SSc7.1Heat Island Effect, Non-Roof	0 / 1
SSc7.2Heat Island Effect-Roof	0 / 1
SSc8 Light Pollution Reduction	0 / 1

WATER EFFICIENCY — 5 OF 10

WEp1 Water Use Reduction-20% Reduction	Y
WEc1 Water Efficient Landscaping	2 / 4
WEc2 Innovative Wastewater Technologies	0 / 2
WEc3 Water Use Reduction	3 / 4

ENERGY AND ATMOSPHERE — 13 OF 35

EAp1 Fundamental Commissioning of the Building Energy Systems	Y
EAp2 Minimum Energy Performance	Y
EAp3 Fundamental Refrigerant Mgmt	Y
EAc1 Optimize Energy Performance	4 / 19
EAc2 On-Site Renewable Energy	0 / 7
EAc3 Enhanced Commissioning	2 / 2
EAc4 Enhanced Refrigerant Mgmt	2 / 2
EAc5 Measurement and Verification	3 / 3
EAc6 Green Power	2 / 2

MATERIALS AND RESOURCES — 7 OF 14

MRp1 Storage and Collection of Recyclables	Y
MRc1.1Building Reuse-Maintain Existing Walls, Floors and Roof	2 / 3
MRc1.2Building Reuse, Maintain 50% of Interior	0 / 1
MRc2 Construction Waste Mgmt	2 / 2
MRc3 Materials Reuse	2 / 2
MRc4 Recycled Content	1 / 2

MATERIALS AND RESOURCES — CONTINUED

MRc5 Regional Materials	0 / 2
MRc6 Rapidly Renewable Materials	0 / 1
MRc7 Certified Wood	0 / 1

INDOOR ENVIRONMENTAL QUALITY — 11 OF 15

IEQp1 Minimum IAQ Performance	Y
IEQp2 Environmental Tobacco Smoke (ETS) Control	Y
IEQc1 Outdoor Air Delivery Monitoring	0 / 1
IEQc2 Increased Ventilation	1 / 1
IEQc3.1Construction IAQ Mgmt Plan-During Construction	1 / 1
IEQc3.2Construction IAQ Mgmt Plan-Before Occupancy	0 / 1
IEQc4.1Low-Emitting Materials-Adhesives and Sealants	1 / 1
IEQc4.2Low-Emitting Materials-Paints and Coatings	1 / 1
IEQc4.3Low-Emitting Materials-Flooring Systems	1 / 1
IEQc4.4Low-Emitting Materials-Composite Wood and Agrifiber Products	1 / 1
IEQc5 Indoor Chemical and Pollutant Source Control	0 / 1
IEQc6.1Controllability of Systems-Lighting	1 / 1
IEQc6.2Controllability of Systems-Thermal Comfort	1 / 1
IEQc7.1Thermal Comfort-Design	1 / 1
IEQc7.2Thermal Comfort-Verification	1 / 1
IEQc8.1Daylight and Views-Daylight	0 / 1
IEQc8.2Daylight and Views-Views	1 / 1

INNOVATION IN DESIGN — 6 OF 6

IDc1.1 Innovation in Design	1 / 1
IDc1.2 Innovation in Design	1 / 1
IDc1.3 Innovation in Design	1 / 1
IDc1.4 Innovation in Design	1 / 1
IDc1.5 Innovation in Design	1 / 1
IDc2 LEED® Accredited Professional	1 / 1

REGIONAL PRIORITY CREDITS — 1 OF 4

SSc3 Brownfield Redevelopment	0 / 1
SSc6.1 Stormwater Design-Quantity Control	1 / 1
SSc7.1 Heat Island Effect, Non-Roof	0 / 1
SSc7.2 Heat Island Effect-Roof	0 / 1
EAc2 On-Site Renewable Energy	0 / 1
MRc1.1Building Reuse-Maintain Existing Walls, Floors and Roof	0 / 1

TOTAL	**65 OF 110**