



BYERLY HALL

GOLD

8 Garden Street, Cambridge, MA, 02138

By choosing to reuse a significant portion of the existing building, selecting low flow water fixtures, specifying low emitting paints and materials, designing day-lit spaces, earning LEED certification, and educating staff and fellows about the sustainable operation of the building, the Radcliffe Institute has again demonstrated a commitment to green design and sustainability.

The 42,000 square foot Byerly Hall renovation includes offices, commons areas, and studios for the Fellows of the Radcliffe Institute for Advanced Study. This three-story building has undergone a complete renovation to accommodate the new requirements for the building use. The ground floor is open to include more public spaces including lounges and meeting rooms. Elevators and entry ramps were renovated to comply with code standards and allow for a more universally accessible facility.



This project marks the third major renovation undertaken by the Radcliffe Institute following the adoption of a master plan that incorporated new sustainability goals. The first renovation following the adoption of the plan, the Radcliffe Gymnasium, had many green features but did not pursue any green building certification. The second building renovation, Schlesinger Library, was completed in February of 2005 and achieved LEED certification. The renovation of Byerly Hall follows and improves upon the environmental achievements of these recent renovations.

The project used LEED for New Construction, version 2.2 to guide and certify green design elements. The Gold certification is a testament to the commitment of the Radcliffe Institute and the design team.

Byerly Hall

Photo: Harvard Green Building Services, 2008

PROJECT HIGHLIGHTS

LEED® Facts

Byerly Hall

Radcliffe Institute for Advanced Study



Location.....Cambridge, MA

Rating System.....LEED v2.2

Certification Achieved.....GOLD

Total Points Achieved.....42/69

Sustainable Sites.....8/14

Water Efficiency.....2/5

Energy and Atmosphere.....7/17

Materials and Resources.....5/13

Indoor Environmental Quality.....15/15

Innovation and Design.....5/5

44% Ground source heat pumps/geothermal are used, which is 44% more efficient than air-cooled pumps.

85.8% diversion of construction waste away from landfills

90% of the building is reused, keeping down costs and reducing environmental impact.

40% water reduction with new dual-flush toilets, waterless urinals, and low flow showers and sinks.

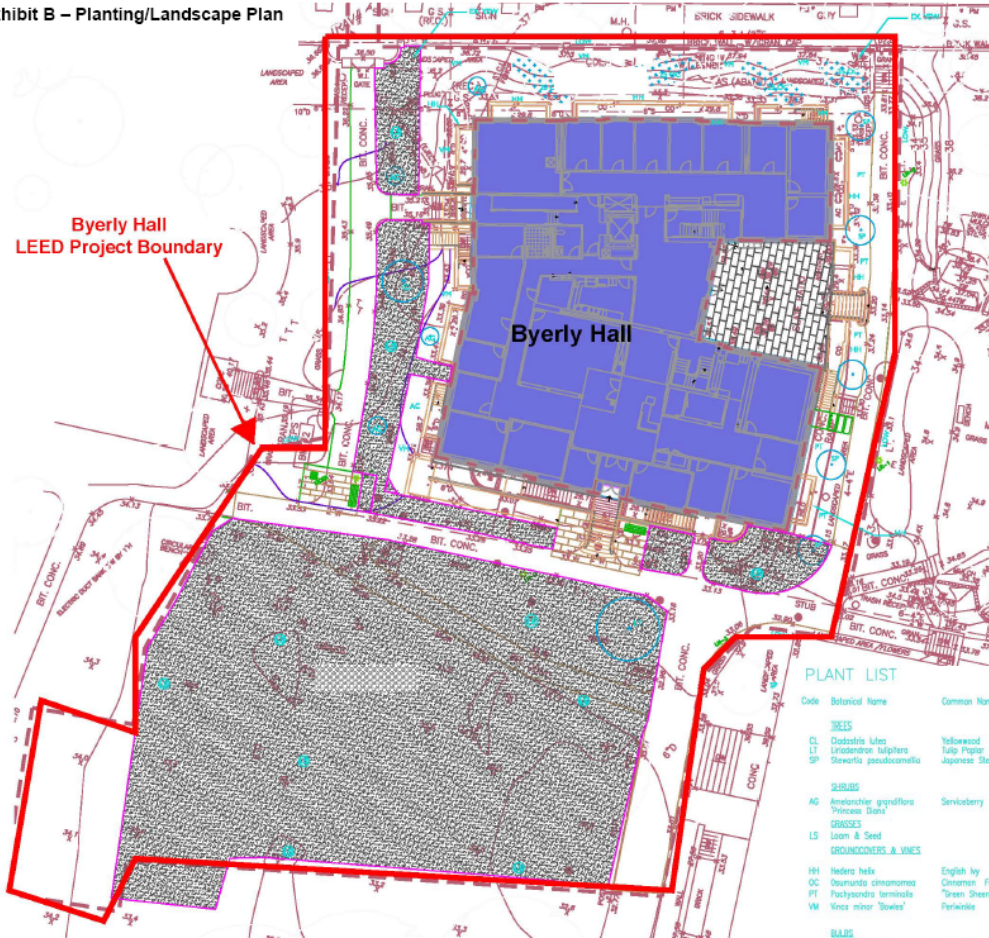
A real-time utility display monitor in the lobby shows tenants how much energy and water the building is using, in real time.



PROJECT OVERVIEW

BYERLY HALL FLOOR PLAN & LEED BOUNDARY WITH OPEN SPACE PLAN

Exhibit B – Planting/Landscape Plan



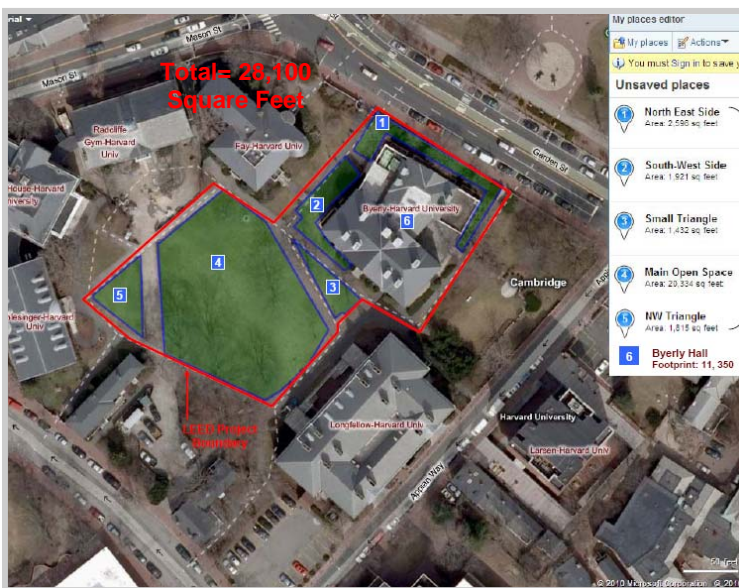
- PLANTING NOTES**
1. Planting contractor shall visit site prior to submitting bid to become completely familiar with site conditions.
 2. No planting will be installed until all grading and construction has been completed in immediate area.
 3. Contractor to verify all utilities on property and to protect all utilities during excavation for plants.
 4. If there is a discrepancy between the number of plants shown on the plan and the number of plants shown in plant list, the number of plants shown on plan will take precedence.
 5. All container material to be grown in container a minimum of 6 months.
 6. All material shall comply with the latest edition of the American Standard for Nursery Stock, American Association of Nurseries.
 7. Contractor shall repair all damage to property from planting operations at no cost to the owner.
 8. Contractor shall guarantee new plant material through one calendar year from time of provided acceptance.
 9. The Landscape Architect will tag all plants at the nursery and inspect them after delivery to the site. All plant materials shall be inspected by the Landscape Architect on site prior to installation.
 10. All proposed plants shall be located carefully as shown on the plans and the placements shall be approved by Landscape Architect before the plants are installed.
 11. All disturbed areas not to be paved or planted shall be located and seeded as shown. The seed rate specifications are as follows: LE300 Fine Fescue 100 lbs/acre, 30% creeping red fescue, 20% sheepsfoot fescue and 10% sheep fescue.
 12. Staking and guying shall be determined by the Landscape Architect on a tree by tree basis. For pricing purposes, provide a per tree unit cost for staking and guying. If staking and guying is required, remove tree wrap, stakes, and guy wires at end of first growing season.
 13. For tree planting in loan areas, any disturbed lawn shall be located and seeded as necessary.
 14. Landscape Architect to tag trees to be protected on site.

- LEGEND**
- Loam & Seed
 - Existing Tree to Remain
 - Groundcover
 - Proposed Tree/Shrub

PLANT LIST

Code	Botanical Name	Common Name	Size	Qty	Notes
TREES					
CL	Cladostis lutea	Yellowwood	2.5-3" cal	1	8&B
LT	Liriodendron tulipifera	Tulip Poplar	4.5-5" cal	1	8&B
SP	Stewartia pseudocornuta	Japanese Stewartia	2.5-3" cal	5	8&B, 8' high branching
SHRUBS					
AG	Amelanchier grandiflora (Prince of Wales)	Servicberry	5-6" H 8&B	4	multistem
GRASSES					
LS	Loam & Seed				6,110sqft
GROUNDCOVERS & VINES					
HH	Hedera helix	English Ivy	1 gal	300	8" o.c.
OC	Ocimum cymosum	Cinnamon Fern	1 gal	100	18" o.c.
PT	Pachysandra terminalis	"Green Sheen" pachysandra	1 gal	800	12" o.c.
VM	Vincetoxicum "Bowles"	Periwinkle	4"gal	4,000	10" o.c.
BLUES					

Byerly Hall
Plan: Goody Clancy Associates, 2010.



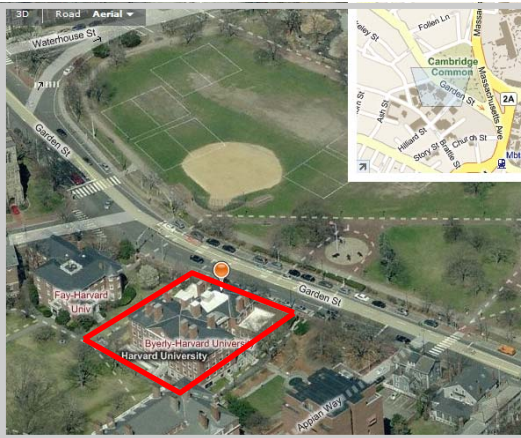
Byerly Hall
Photo: Bing Maps, 2010.

PROJECT TEAM

Owner	Radcliffe Institute for Advanced Study
Project Manager	Harvard Real Estate Services
Architect	Goody Clancy
Contractor	Shawmut Design and Construction
Civil Engineer	Green International
Environmental Geotechnical Engineer	Haley & Aldrich, Inc.
Structural Engineer	JKP Structural Engineering Corp
HVAC Engineer	Cosentini Associates
Commissioning Authority	Facilities Dynamics Engineering
Sustainability Consultant	Harvard Green Building Services



SITE



Byerly Hall 8 Garden Street, Cambridge, MA



Photo: Goody Clancy, 2009

- ▶ Stormwater from three roof gutters is diverted away from existing stormlines and into dry wells with a capacity of 1,140 cubic feet. This reduces the rate and quantity of stormwater runoff and allows for groundwater recharge.
- ▶ Erosion and Sedimentation Control: Watering to keep down dust, washing wheels at site egresses, and building silt sacks on surrounding catch basins are some of the ways the project controlled erosion and sedimentation on site during construction.
- ▶ The building is located within walking distance to the Harvard Square MBTA stop, several bus lines, and the Harvard University shuttle.
- ▶ In addition to promoting carpooling, Harvard provides a free shuttle service, assists bicyclists by identifying bike routes and providing adequate racks. Byerly seeks to make bicycle commuting easier by providing a shower and changing room in the basement of the building.
- ▶ Campus Zipcar – Harvard provides nearby parking for a fuel-efficient hybrid Zipcar. This shared vehicle can be reserved by building occupants, which reduces their need to bring their own vehicle to campus, and possibly eliminates their need to own a vehicle altogether
- ▶ The building is located in a dense urban area, with pedestrian access.

WATER EFFICIENCY

Byerly’s restrooms include low flow fixtures that reduce water consumption. All toilets have dual-flush valves, and all urinals are waterless. The shower provided in the basement for bicycle commuters and others are low-flow as well. Combined, these measures are expected to reduce domestic water consumption in the building by **40.1%** when compared with standard fixtures.

Differences in the Flush & Flow Rates for EPA 1992 Standard Fixtures and the fixtures installed for the Byerly Hall Project

Fixture Type	Byerly Hall Flush & Flow Rates	EPA 1992 Standard Flush & Flow Rates
Water Closet [GPF]	.8 - 1.6	1.6
Urinal [GPF]	0	1.0
Bathroom Sink [GPM]	.5	2.5
Shower [GPM]	1.6	2.5
Kitchen Sink	2.5	2.5
GPF - Gallons Per Flush	GPM - Gallons Per Minute	

FIXTURES IN BYERLY HALL PROJECT SCOPE



Showerhead:
Symmons Allura 1.6 gpm
Dual Flush Flushometer:
Sloan WES-111 shown



ENERGY EFFICIENCY

MECHANICAL SYSTEMS

The Radcliffe Institute employed a wide array of technologies to help reduce energy consumption in Byerly Hall, including:

Variable Speed Pumping: Many pumps in the building are connected to variable speed drives. When full load is not required, these pumps slow down, greatly reducing energy consumption.

CO2 Sensors: Classrooms are equipped with CO2 sensors that are tied to the ventilation system. Variable Air Volume (VAV) boxes supply higher volumes of fresh air when the rooms are fully occupied. When classroom occupancy decreases, energy is saved by reducing ventilation down to minimum requirements.

Added Insulation: 2" rigid insulation is added around the foundation, giving an R-value of 10. A combination of glass fiber insulation and polyurethane spray insulation is added to all exterior walls, giving them an R value of 19 and reducing air infiltration. Polyurethane spray insulation is also added to the roof, in greater thickness, giving an R value of 30. Combined with weather stripping around doors and tight fitting windows, this added insulation means that much less energy is required to heat and cool Byerly Hall following the renovation.

Sub-Metering: A number of systems are metered beyond the basic utilities required for billing. These include domestic hot and cold water usage, building heating, building cooling energy, and electricity consumption by lights and plug loads, and elevators. This information gives building managers a more complete picture of how the building is operating.

Measurement and Verification: Using the information provided by building sub-meters, building managers will be able to verify the efficiency of the geothermal heating and cooling system, variable air volume effectiveness, variable frequency drives on motors and other efficiency measures. If systems are not performing as expected, modifications will be made.

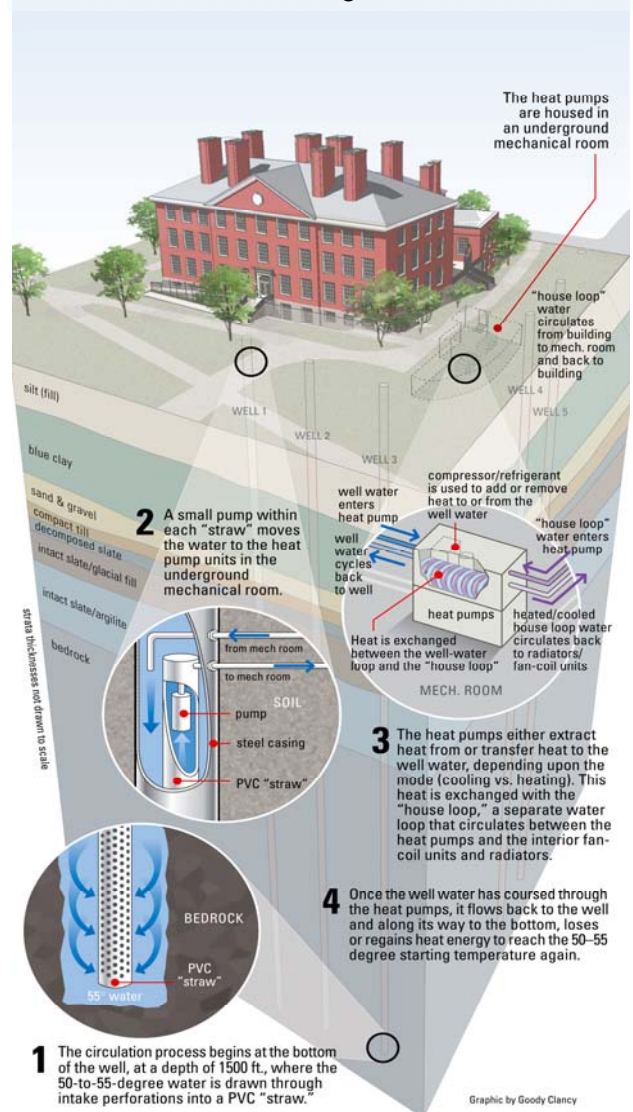
Commissioning: Byerly's mechanical systems were fully reviewed by an independent commissioning agent to ensure that they are running as they were designed.

ELECTRICAL SYSTEMS

Efficient Indoor Lighting: A combination of high efficient light fixtures, high efficient bulbs, and good lighting layout design allows apartment units to use less than half the power density of a standard building.

Premium Efficiency Motors: All motors in the project meet NEMA (National Electric Manufacturers Association) requirements for premium efficiency.

Geothermal Heating and Cooling: Geothermal uses the free, sustainable temperature of the Earth to reduce the amount of energy consumed to heat and cool a building.



Byerly Hall

Image: Goody Clancy Associates



INDOOR ENVIRONMENTAL QUALITY

Radcliffe Institute is committed to providing a healthy indoor environment for all occupants. The project team was careful to maintain healthy indoor air quality during construction and to also ensure the space is designed to promote healthy

Ventilation Rates: Rates exceed ASHRAE minimums by at least 30% in all spaces.

Air Quality Management: Measures taken include: sealing air ducts to keep out dust, protecting absorptive materials with plastic wrapping, keeping dust from spreading with plastic curtains, and scheduling painting to take place prior to the installation of absorptive materials such as furniture and carpet.

Low-Emitting Materials: Volatile Organic Compounds (VOCs) were kept to a minimum, and below the LEED maximums for all adhesives, sealants, paints, and carpets.

User Control: Lighting and temperature systems in classrooms, offices and common spaces can be individually controlled, so occupants can define their own comfort levels.

Janitors' closets: All janitors closets have their own exhausts and are kept at a negative pressure, so that any fumes from cleaning products will not leak into occupied spaces.

No Smoking: is allowed inside or within 25 feet of the building.

Green Cleaning: Radcliffe has contracted with Unicco to provide a cleaning service that not only achieves cleanliness, but does so in a way that protects the health of building occupants and cleaning staff, and reduces impact on the environment. All cleaning products will be Green Seal certified. A set of best practices has been developed, including: careful placement and cleaning of mats near entryways to limit the amount of dirt coming into the building, lint-free clothes instead of feather dusters, highly concentrated cleaning products to reduce packaging, and metal free floor sealers. All cleaning staff who work at Byerly Hall will be trained in these procedures.

Daylight and Views: Over 94% of regularly occupied rooms meet the LEED requirement for day lighting, and over 96% have views to the outdoors.

Construction IAQ Measures Implemented During Construction

Air ducts sealed to prevent dust from gathering during construction



Absorptive materials protected to prevent mold and mildew growth



Gypsum board stored off of the floor to prevent moisture accumulation

MATERIALS & WASTE

Over 90% of the mass of Byerly Hall was reused, drastically reducing the environmental impact of harvesting and processing building materials as compared to the construction of a new building. Materials selection for this renovation was also done carefully with environmental concerns in mind.

Recycled Content: Whenever possible, materials with recycled content were chosen, including: Styrofoam insulation, TPO roofing, metal doors, window glass, drywall, ceiling panels, linoleum flooring, carpet, and even bulletin boards.

Regional Materials: Over 10% of building materials (by cost) used on the project were manufactured regionally.

Construction and Demolition Waste: Over 90% of construction and demolition waste was diverted from landfills for reuse or recycling.

Low-Mercury Lighting: While fluorescent lighting is more efficient than other lighting types, standard fluorescent bulbs contain mercury, which can be hazardous if bulbs break, and when they are disposed. Byerly Hall has specified low-mercury lamps to reduce this risk, and has adopted a policy to continue purchasing this type of lamp whenever replacing bulbs.

Real-time Utility Screens: Tenants are able to see the building's energy and water consumption in real-time on a touch screen in the lobby, just in side the front doors. These systems have proven at other colleges, such as Oberlin, to dramatically reduce consumption. because occupants are constantly reminded of how much is being consumed and they can instantly see the results when the make an effort to conserve. See the screen here: <http://buildingdashboard.com/clients/harvard/byerly/>



Photos: Goody Clancy, 2009

ADDITIONAL RESOURCES

- > Radcliffe Institute of Advanced Studies: <http://www.radcliffe.edu/>
- > Radcliffe Sustainability: <http://green.harvard.edu/radcliffe>
- > Harvard Green Building Services: <http://green.harvard.edu/green-building-services>
- > Harvard Green Building Resource: <http://green.harvard.edu/theresource>