



HARVARD BUSINESS SCHOOL McCULLOCH HALL

44 HARVARD WAY, BOSTON, MA 02163

LEED-CI V2.0 PLATINUM

The McCulloch Hall project was a 35,127 square foot renovation of a 53,235 sf foot residence hall for 84 MBA students at the Harvard Business School in Boston, Massachusetts. The building was originally constructed in 1926. During the summer of 2008, the Harvard Business School began a partial renovation of the building's interior, with the primary purpose being to upgrade the building's life safety systems, lighting, and finishes while meeting sustainability goals and adhering to the Harvard University Green Building Guidelines. The project has achieved LEED-CI v2.0 Platinum certification, the highest LEED certification level possible.



McCulloch Hall Photo: Harvard Business School, 2009

The scope of the project included installing a more complete fire sprinkler system and upgrading light fixtures to increase efficiency. Given the invasive nature of this work and the limited access to the building during the regular academic year, HBS took this opportunity to also redesign the layout of some of the student rooms in order to increase rent-ability, appeal, efficiency, and sustainability. The finish upgrades included new flooring, such as new carpet in the corridors and student rooms, new ceiling tile, lighting, window repair, new vanities, and new low-flow plumbing and fixtures. Built-in millwork, such as fan coil covers, were refurbished. Minor HVAC work, such as new bathroom vent fan units, electrical upgrades, some controls, and electric and water meters, were included for a portion of the building.

PROJECT HIGHLIGHTS

LEED® Facts

McCulloch Hall Renovation Harvard Business School 2008 Renovation



Location.....Boston, Massachusetts Rating System.....Commercial Interiors v2.0 Certification .....Platinum Total Points Achieved.....44/57

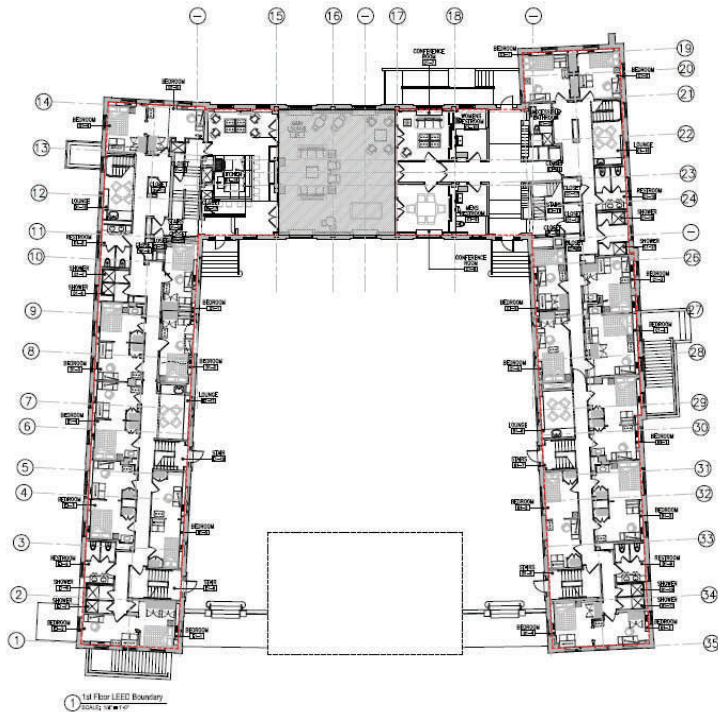
Sustainable Sites.....6/7 Water Efficiency.....2/2 Energy and Atmosphere.....4/12 Materials and Resources.....13/14 Indoor Environmental Quality.....4/17 Innovation and Design.....5/5

- 31% reduction in potable water consumption
100% of the existing shell and 70% of the interior non-structural elements were retained and reused
30% reduction in lighting power density (watts/square foot) below the code standard
30% increase in ventilation rates above the code standard, to promote healthy indoor air quality
80% of all construction and demolition waste was diverted from landfills.

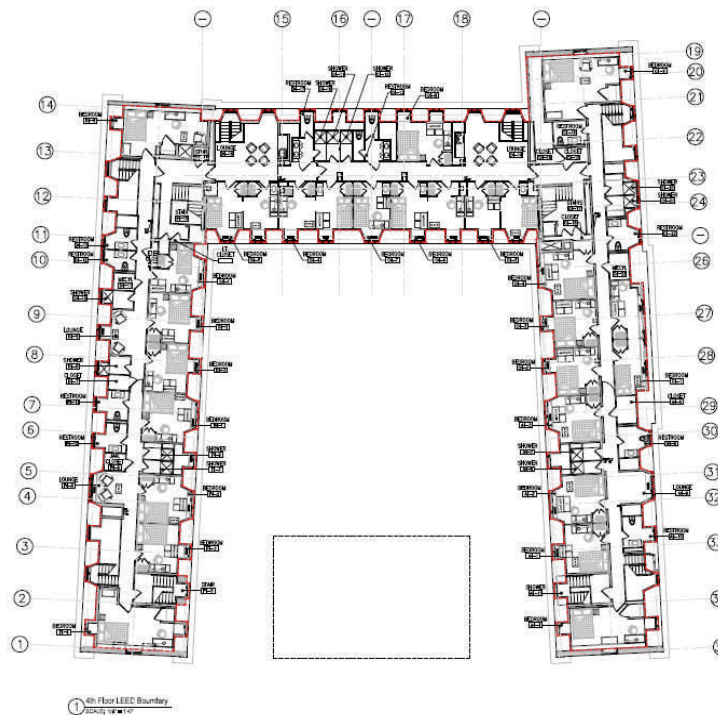


## PROJECT OVERVIEW

### McCULLOCH FLOOR PLAN & LEED BOUNDARY



The McCulloch Hall project included four residential floors and a small portion of the basement level. These two boundary drawings represent the general layout of work.



**Kitchen**

Photo: Harvard Business School, 2009

## PROJECT TEAM

<b>Owner</b>	Harvard Business School
<b>Project Manager</b>	David Zenga, Harvard Business School
<b>Architect</b>	Baker Design Group
<b>Construction Management</b>	Shawmut Design and Construction
<b>HVAC Engineer</b>	BLW Engineers, Inc.
<b>Commissioning Authority</b>	Michael Williams, MAW
<b>Sustainability Consultant</b>	Harvard University Office for Sustainability Green Building Services



**Typical Dorm Room**

Harvard Business School, 2009





## SITE



- To encourage alternatives to driving, all occupants of McCulloch Hall have access to Harvard's comprehensive **CommuterChoice Program**, which provides incentives and discounts for all modes of alternative transportation, as well as carpooling and fuel efficient vehicles.
- The building is located within walking distance to multiple MBTA bus stops and Harvard University shuttle bus stops.
- A bicycle rack with a total capacity of 18 bicycles is located adjacent to McCulloch Hall. Additionally, there are 315 spaces for bicycle storage within 200 yards of the McCulloch Hall entrance. As this is a residence hall, showers are located in the McCulloch Hall rooms.
- The building is located in a dense urban area, which allows occupants to walk and easily access amenities such as restaurants, banks, churches, and retail stores.

### McCulloch Hall

44 Harvard Way, Boston, MA 02163



- ★ McCulloch Hall
- ★ MBTA Bus Stops
- ★ Harvard University Shuttle Bus Stops



### Bike Racks

Photo: Office for Sustainability, 2009

## WATER EFFICIENCY

Water-efficient fixtures are installed in the McCulloch Hall restrooms. These fixtures reduce domestic water consumption by **31%** compared to standard EPAAct 1992 fixtures. This is the equivalent of saving over **179,340** gallons per year.

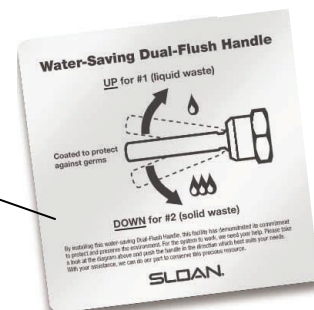
Differences in the Flush & Flow Rates for EPAAct 1992 Standard Fixtures and the fixtures utilized by the SEAS IT Office Occupants		
Fixture Type	McCulloch Hall Flush & Flow Rates	EPAAct 1992 Standard Flush & Flow Rates
Water Closet [GPF]	1.1 and 1.6	1.6
Urinal [GPF]	N/A	1.0
Bathroom Sink [GPM]	0.5	2.5
Shower [GPM]	1.5	2.5
Kitchen Sink [GPM]	0.5	2.5
GPF - Gallons Per Flush    GPM - Gallons Per Minute		

## FIXTURES



### Dual Flush Toilet Fixture

Photo: Harvard Business School, 2009



### Lavatory Fixture (0.5 GPM)

Photo: Harvard Business School, 2009



## ENERGY EFFICIENCY

The Harvard Business School has committed, along with Harvard University as a whole, to reduce greenhouse gas emissions 30% below 2006 levels by 2016, inclusive of growth. Therefore energy efficiency was a primary goal of this renovation project.

### MECHANICAL SYSTEMS

Each occupied space is provided with an induction unit for heating, ventilating and air conditioning. Additional energy savings comes from reducing domestic hot water demand with low-flow sinks and showers.

**Commissioning:** To ensure that energy-related systems were installed to maximize energy efficiency, the Harvard Business School fully commissioned the building's energy systems, ensuring efficiently prior to occupancy.

**Energy Conservation:** The use of energy efficient equipment, automatic temperature controls, building insulation, and high efficiency glazing provides a conservation beyond code.

**Occupancy Sensors:** Temperature is regulated based on occupancy sensors and setbacks ranging from 70 degrees when occupied to 55 when unoccupied. However, all controls are local and occupants have access to change and control set points.

**Renewable Energy Certificates:** Renewable energy certificates were purchased from Sterling Planet for 100% of projected energy use for a two-year period. The certificates are for 100% green-e sources. This is the equivalent of not driving 150 passenger cars for one year, or 89 household's annual electricity use.



**Typical Dorm Room with LED Task Lighting**

Photo: Harvard Business School, 2009



**Occupancy Sensors in McCulloch Hall corridors**

Photo: Harvard Business School, 2009

### ELECTRICAL SYSTEMS

New lighting was installed in the building, and lighting power density is reduced by over 30% over ASHRAE 90.1-2004 minimums. The lighting includes new T5 and T8 lighting in addition to LED task lighting.

**Motion Sensor Lighting:** For all common areas the lighting controls consist of motion sensors and daylight dimmers. Bathrooms have occupancy controlled sensors.

**Light Pollution Control:** Lighting was selected and installed such that the majority of the lighting lumens remain inside the building and do not extend to the exterior.

**Efficient Fixture Types:** Lighting fixture types are the most efficient, T5 fixtures are used where ever possible and LED task lights are provided. Additionally , exit signs are LED type with edge lighting.



# INDOOR ENVIRONMENTAL QUALITY

The Harvard Business School 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 indoor air quality during occupancy.

### Indoor Air Quality During Construction:

A comprehensive indoor air quality management plan was implemented during construction to maintain healthy indoor air quality.

During the renovation, the construction team implemented an Indoor Air Quality Management plan to ensure the health of the workers and the eventual inhabitants. Some of the aspects of the plan included walk-off mats to reduce the amount of debris tracked into the project, protecting all rooms with finishes that were to remain, masking all return grills and ventilation with polyethylene sheets, green sweep practices, and storing all materials in cool, dry areas to prevent mold.

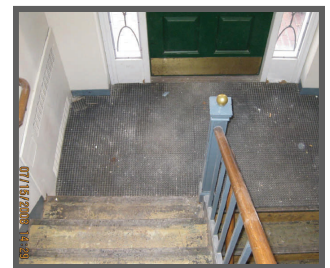
Only low-emitting (low-VOC) paints, primers, adhesives, sealants, and carpet were used in the project. Volatile Organic Compounds (VOCs) are chemical compounds and known carcinogens found in many construction materials that are considered detrimental to indoor air quality. Reducing the use of VOCs whenever possible improves indoor air quality and consequently occupant health and productivity.

### Construction IAQ Measures Implemented During Construction

Photos: Shawmut, 2008



**Masked Ventilation:**  
Keeps filters clean and air fresh



**Walk-Off Mats at Entrance:**  
Reduces debris tracked into site



**Low VOC Products:**  
For healthy indoor air quality

Product Category	Product & Manufacturer	VOC Content (g/l)	VOC Limit (g/l)	Standard
<b>Paints &amp; Coatings</b>	➤ Eco Spec Interior Latex Primer Sealer	0	150	Green Seal GS-11
	➤ Eco Spec Interior Latex Flat	0	50	SCAQMD Rule 1113
	➤ Becker Alkaline 318-40	52	350	SCAQMD Rule 1113
	➤ Eco Spec Interior Latex Eggshell Enamel	1	150	Green Seal GS-11
	➤ Aura Satin Waterborne Interior Paint	48	150	Green Seal GS-11
<b>Adhesives &amp; Sealants</b>	➤ 3M Fastbond Contact Adhesive 30-NF	77	250	SCAQMD Rule 1168
	➤ FORBO L-910 Linoleum Adhesive	0	50	SCAQMD Rule 1168
	➤ 440SF Supreme Commercial Adhesive	0	50	SCAQMD Rule 1168
	➤ Laticrete Tri-Poly Sanded Grout (1500)	25	65	SCAQMD Rule 1168
	➤ Mapei Ultra Bond Eco 575	0	50	SCAQMD Rule 1168



**Indoor Air Quality Management**

Photo: Harvard Business School, 2009

### Carpets and Carpet Adhesives:

- Bolyu Modern Form and Visual Order CRI Green Label Plus 7078 with APAC 440SF Supreme Commercial Multipurpose Adhesive (AA-754332), SCAQMD Rule #1168

### Composite Wood and Laminate Adhesives:

- SierraPine Arreis MDF, PC-5 UF Free Door, Sky Blend Particleboard, Georgia Pacific Platinum Plywood, and Uniboard NuGreen particleboard: all free of added urea-formaldehyde

### Low Emitting Systems Furniture:

- Caper Chair, Herman Miller– Greenguard certified



## MATERIALS & WASTE

Choosing materials with high recycled content and minimizing the amount of construction waste sent to landfill was a high priority for the project team. Sourcing materials from within 500 miles, the team adequately reduced the carbon emissions associated with the transportation of materials. Local materials include gypsum wall board, interior metal, insulation, ceiling tile and grid, and hollow metal frames. Rapidly renewable materials are defined by the USGBC as materials that have a ten year growing cycle or less. Both the acoustic ceiling tile and wood doors contain a percentage of rapidly renewable material. Over half of the new wood (by cost) is Forest Stewardship Council Certified. In addition, much of the furniture used in the project was salvaged, including furniture for the lounges, guest suite, and student rooms.

**80%** of all construction and demolition waste was diverted from landfills.



**Kitchen**

Photo: Harvard Business School, 2009

### ENVIRONMENTALLY PREFERABLE MATERIALS IN McCULLOCH HALL

- > Composite Wood (SierraPine Arreis)  
 Recycled Content: **100%** pre-consumer  
 Regional: **8 Miles** (Woburn, Massachusetts)
- > Gypsum Wall Board (USG Architectural Services)  
 Recycled Content: **95%** pre-consumer, **5%** post-consumer  
 Regional: **360 Miles** (Baltimore, Maryland)
- > Ceiling Tile (Armstrong Ultima #1912 HRC)  
 Recycled Content: **65%** pre-consumer, **15%** post-consumer  
 Regional: **315 Miles** (Lancaster, Pennsylvania)
- > Hollow Metal Frame (De La Fontaine)  
 Recycled Content: **6.6%** pre-consumer, **24.6%** post-consumer  
 Regional: **8 Miles** (Woburn, Massachusetts)
- > Interior Metal (Dietrich Metal Framing)  
 Recycled Content: **16.7%** pre-consumer, **36.9%** post-consumer  
 Regional: **200 Miles** (Boonton, New Jersey)



**Exterior View**

Photo: Harvard Business School, 2009

## ADDITIONAL RESOURCES

- > Harvard Business School: <http://www.hbs.edu/>
- > Sustainability at HBS: <http://green.harvard.edu/hbs/green-living>
- > Harvard OFS - Green Building Services: <http://green.harvard.edu/green-building-services>
- > Harvard OFS - Green Building Resource: <http://green.harvard.edu/theresource>

