

## 1ST FLOOR LAB, HERBARIA BUILDING

22 DIVINITY AVE, CAMBRIDGE, MA 02138

**LEED-CI v2.0  
GOLD 2010**

Originally constructed in 1954 and located at 22 Divinity Avenue in Cambridge, Massachusetts, the four-story Harvard University Herbaria Building, housing more than 5 million specimens, is the world's largest university-owned herbarium

The 5,100 square foot renovation of the First Floor Lab was done to accommodate four faculty members and their researchers within the Faculty of Arts and Sciences, Organismic & Evolutionary Biology (OEB) Department. The renovated space now includes one (1) large wet lab, one (1) small lab, seven (7) small rooms for specialized research and equipment and two (2) restrooms. The scope included layout, mechanical, electrical, plumbing, fire protection, tel/data, and lab equipment upgrades. Construction was completed in August 2009.

The new space will be used for research in forest ecology, plant diversity and broader impacts of global change on terrestrial ecosystems.



**Main Wet Lab**

Photo: Walsh Brothers Incorporated, 2009

The Harvard Faculty of Arts and Sciences and the OEB Department are committed to sustainability and reducing greenhouse gas emissions. This renovation meets all applicable Harvard Green Building Guideline requirements, and has achieved LEED-CI Gold certification, making it the University's 39th certified project.

### PROJECT HIGHLIGHTS

#### LEED® Facts

**Harvard Herbaria, 1st Floor Lab  
Faculty of Arts and Sciences  
2009 Renovation**



Location.....	Cambridge, Massachusetts
Rating System.....	Commercial Interiors v2.0
Certification Pending.....	Gold
Total Points Achieved.....	33 / 57

Sustainable Sites.....	5/7
Water Efficiency.....	2/2
Energy and Atmosphere.....	6/12
Materials and Resources.....	6/14
Indoor Environmental Quality.....	9/17
Innovation and Design.....	5/5

**71%** of the total material value came from materials manufactured within 500 miles of the project site.

**89%** of the total value of new wood used in the project is Forest Stewardship Council (FSC) Certified.

**47%** reduction in water consumption over EPA 1992 compliant fixtures.

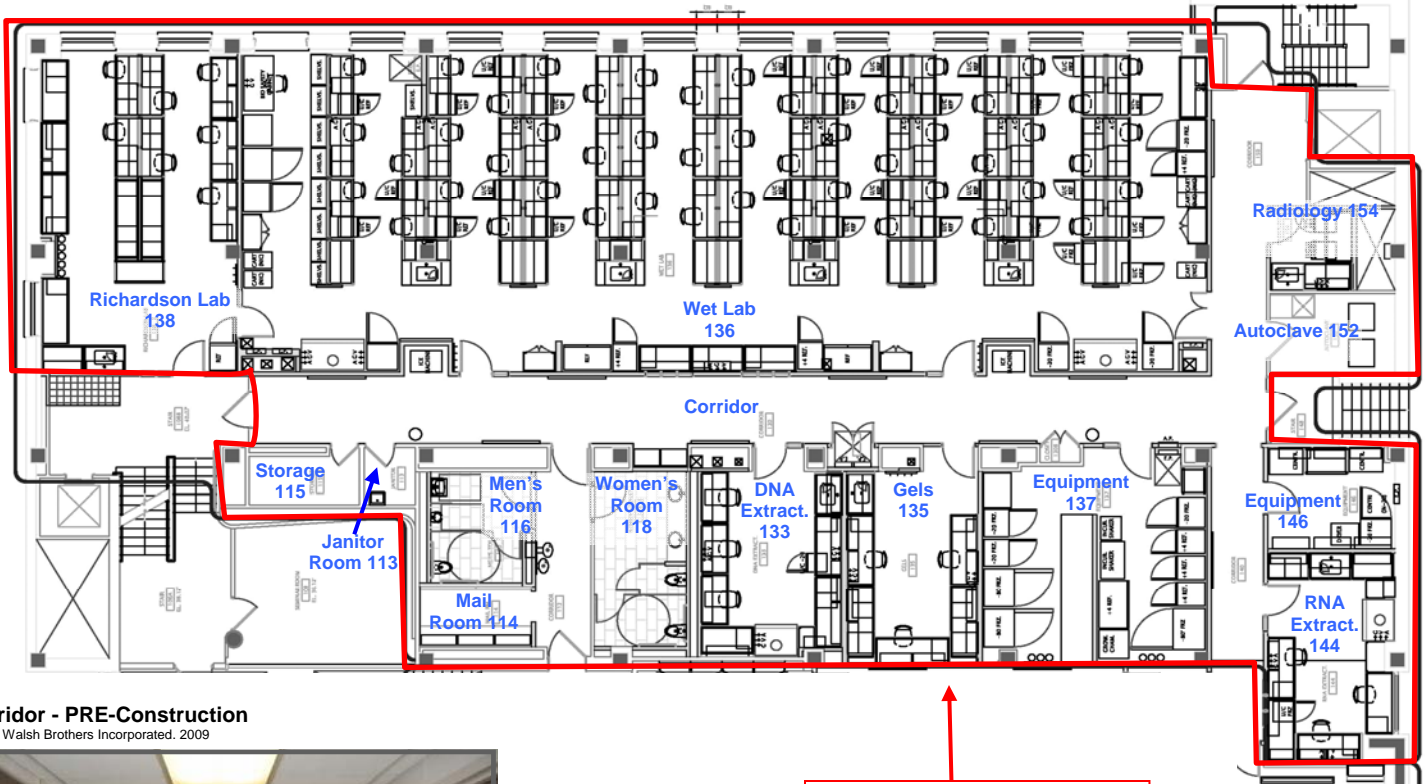
**95%** of the equipment and appliances are Energy Star® rated

The temperature settings and the lighting in the main lab spaces are tied together on occupancy and ultrasonic sensors.

Only low or zero-VOC materials were used during construction



## PROJECT OVERVIEW



Corridor - PRE-Construction

Photo: Walsh Brothers Incorporated. 2009



Corridor-POST-Construction

Photo: Walsh Brothers Incorporated. 2009

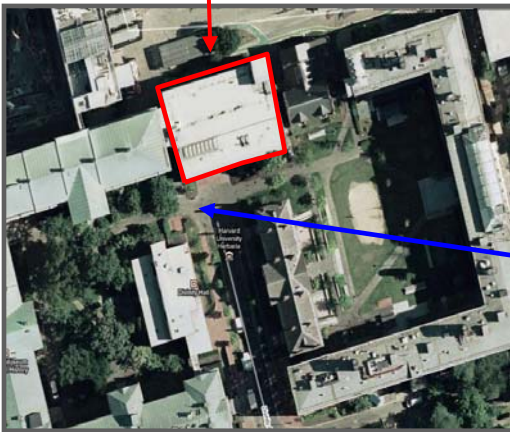


## PROJECT TEAM

<b>Owner</b>	Harvard Faculty of Arts and Science
<b>Project Manager</b>	Casali Group, Inc
<b>Architect</b>	Hecht & Associates Architects, Inc
<b>Contractor</b>	Walsh Brothers, Incorporated
<b>Lighting Engineer</b>	R.W. Sullivan Engineering
<b>HVAC Engineer</b>	Exergen Corporation
<b>Commissioning Agent</b>	Augustus Engineering Services
<b>Sustainability Consultant</b>	Harvard University, Office for Sustainability Green Building Services



## SITE



**Herbaria Building**  
22 Oxford Street, Cambridge, Massachusetts

- To encourage alternatives to driving, all occupants have access to Harvard's comprehensive **CommuterChoice Program**, which provides incentives, such as discounts, for all modes of alternative transportation as well as carpooling and fuel efficient vehicles. The Program is promoted through informational kiosks in building common areas and an extensive website. ([www.commuterchoice.harvard.edu](http://www.commuterchoice.harvard.edu))
- The building is located within walking distance to the Harvard Square MBTA stop, several bus lines, and the Harvard University Shuttle.
- The Herbaria provides bicycle racks adjacent to the building and shower and changing facilities are located on the 3rd floor.
- The building is located in a dense urban area with several services, which allows occupants to walk and easily access amenities such as restaurants, banks, churches, and retail stores.



**Bike Racks at the Herbaria Building entrance**  
Photo: Jessica Eisenman Parks. Harvard Office for Sustainability. 2009

## WATER EFFICIENCY

The Herbaria First Floor Lab LEED Boundary includes the renovation of two bathrooms. Per project specifications, only water efficient fixtures were installed, which **reduces domestic water consumption by 47% over standard EAct 1992 fixtures**. This is the equivalent of saving over 80,000 gallons per year.

Differences in the Flush & Flow Rates for EAct 1992 Standard Fixtures and the fixtures installed for the Herbaria First Floor Lab Project

Fixture Type	Herbaria 1st Floor Lab Flush & Flow Rates	EAct 1992 Standard Flush & Flow Rates
Water Closet [GPF]	Dual-Flush 1.6 & 1.1	1.6
Urinal [GPF]	0.125	1.0
Bathroom Sink [GPM]	0.5	2.5
Shower [GPM]	1.5	2.5
GPF - Gallons Per Flush	GPM - Gallons Per Minute	

## FIXTURES IN HERBARIA PROJECT SCOPE



**1st Floor Lab Bathroom**  
Photo: Walsh Brothers Incorporated. 2009

**SLOAN UPPERCUT®**  
Dual-Flush Flushometer  
(Up 1.1 gpf and Down 1.6 gpf)



**TOTO® TEL5LSC-10**  
0.5 GPM Sensor Faucet,  
Standard Spout, EcoPower™  
Self-Generating System



## ENERGY EFFICIENCY

FAS has committed, along with the larger Harvard University, to reduce greenhouse gas emissions 30% below 2006 levels by 2016, inclusive of growth. To this end, energy efficiency was one of the primary sustainability-related goals in this renovation project.

### Mechanical Systems

- **Building Automation System:** All automatic temperature controls are direct digital control (DDC). Automatic controls provide energy savings based on system zoning, scheduling, occupied/unoccupied setbacks and demand control ventilation. This system monitors all the carbon dioxide(CO<sub>2</sub>) sensors throughout the building and modulates the air handling unit return, exhaust and outdoor air dampers as required to maintain the CO<sub>2</sub> setpoints.
- **Occupancy-Based Ventilation:** Occupancy sensors installed in each room reduce exhaust and makeup air rates when a room is unoccupied for a minimum of 60 minutes.
- **Indicator Panel/Override Box:** These make it possible to safely employ occupancy setbacks for ventilation rates in labs. When the room is in setback mode and not maintaining ventilation rates safe for occupied use, the red light is on. The orange light comes on when the system is raising ventilation rates, and the green light means that it is safe to use the lab. If the green light does not come on after occupancy there is an override switch to turn the system on.
- **Plug Loads:** Energy Star equipment was selected for all Energy Star-eligible equipment in the space. This includes three computers and a commercial refrigerator.
- **Commissioning:** The mechanical and electrical systems were fully commissioned by a third-party Commissioning Authority, which ensured that all energy-related systems were installed as designed, and operating efficiently prior to occupancy.
- **Renewable Energy:** Renewable Energy Certificates (RECs) were purchased from Sterling Planet (wind power) equivalent to 100% of the anticipated electricity use.
- **High Performance Fume Hoods** The Wet Lab has 2 Variable Air Volume (VAV) fume hoods, which can reduce exhaust rates when the sashes are closed. The VAV hoods have become standard practice for energy-efficient operation. To conserve even more energy, the fume hoods installed have reduced face velocities, which run at 80 feet per minute (fpm); whereas, traditional face velocities are 100fpm.

### Electrical Systems

- **OCCUPANCY SENSORS** All rooms within the project scope have occupancy sensors that turn the lights in a space off when sensors have not been activated by motion for set periods of time. These occupancy controls sensors also control the ventilation setbacks.
- **Light Fixtures:** Energy-efficient fluorescent lighting fixtures and lamps were carefully chosen and placed to reduce electricity consumption.



**Occupancy Sensors:**  
Control Lighting and  
Ventilation Rates



**Indicator Panel**  
Green Light means it  
is safe to work in the  
Lab



**DNA Extract - Room 133**  
Photo: Walsh Brothers Incorporated. 2009

## INDOOR ENVIRONMENTAL QUALITY

The Harvard Faculty of Arts and Sciences and the Organismic & Evolutionary Biology (OEB) Department are 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

**Indoor Air Quality During Construction:** The building maintained occupancy throughout construction. Thus, a comprehensive indoor air quality management plan was implemented during construction to maintain healthy indoor air quality. For example, all grills and vents were sealed and a HEPA Filtration unit maintained negative pressure to keep any construction debris from migrating into occupied spaces.

Only products with **Low or No VOC Content** were used in the Herbaria project. Volatile Organic Compounds (VOCs) are chemical compounds and known carcinogens found in many construction materials, and are considered detrimental to indoor air quality. Reducing the use of VOCs whenever possible improves indoor air quality and consequently occupant health and productivity. VOC limits are set by Green Seal standards and the South Coast Air Quality Management District Rules #1168 and #1113.

- **COMPOSITE WOOD AND LAMINATE ADHESIVES:** There is no added Urea Formaldehyde in any of the products used.
- **LOW EMITTING MATERIALS, SYSTEMS FURNITURE AND SEATING:** : Steelcase Think® Chairs are SCS Indoor Advantage™ Gold.
- **PAINTS AND COATINGS | ADHESIVES AND SEALANTS:** All interior paints used in the project have 0 VOC Content.



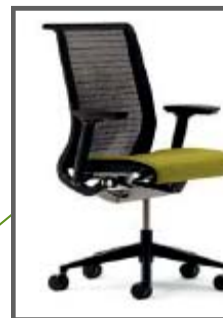
**IAQ Management**  
Housekeeping:  
Protection of porous building materials prior to installation.



**IAQ Management**  
HVAC Protection:  
Ductwork kept sealed before installation



**Low VOC Sealants**  
Design Polymerics  
DP1010 Water Based  
Duct Sealant



**Low Emitting Materials**  
Steelcase Think® Task  
Chair

Product Category	Product & Manufacturer	VOC Content (g/l)	VOC Limit (g/l)	Standard
Paints & Coatings	➤ Pittsburgh Paints Pure Performance® Interior Eggshell Latex Paint (PPG Industries, Inc)	0.0	100.0	Green Seal, GS-11
	➤ Speedhide® Super Tech® WB Acrylic Dry Fog (PPG Industries, Inc)	30.0	400.0	SCAQMD Rule #1113
Adhesives & Sealants	➤ Armstrong S-700 Thin Spread Floor Adhesive	0.0	50	SCAQMD Rule #1168
	➤ Tremsil 200, General Construction Grade Silicone Sealant	35.0	250	SCAQMD Rule #1168



**Lighting Control:** The large wet lab is divided into multiple lighting zones to allow lighting to be switched to suite the task within the zone. The lighting controls consist of 3-way and 4-way switches to allow occupants to control the lighting as they enter/exit the zone.

**Thermal Comfort Survey:** To ensure comfort, occupants will be surveyed about their thermal comfort at least once per season. FAS Operations will adjust the heating or cooling in the project space as needed.

**Main Wet Lab**

Photo: Walsh Brothers Incorporated. 2009



## MATERIALS AND WASTE

Selecting environmentally preferable materials and minimizing the amount of construction waste sent to landfill was important to the project. When selecting materials, preference was given to locally manufactured, low-emitting materials with recycled content. Additionally, accounting for the long lead times associated with FSC Certified wood casework and flooring from the beginning ensured that the majority of new wood in the project was sustainable.

**90%** of the construction waste was diverted from landfills.

**17%** of the total material value consists of post-consumer and/or pre-consumer recycled content materials.

**71%** of the total material value consists of materials manufactured within 500 miles of the project site

**89%** of the total value of new wood used in the project is Forest Stewardship Council (FSC) Certified.

### ENVIRONMENTALLY PREFERABLE MATERIALS IN HERBARIA FIRST FLOOR LAB

- Roofing Membrane (Sarnafil G-410)  
Recycled Content: **12%** post-consumer, **1%** pre-consumer  
Regional: **25 Miles** (Canton, MA)
- FSC Particleboard Core Wood Door (Algoma)  
Recycled Content: **61%** pre-consumer
- Gypsum Wallboard (USG)  
Recycled Content: **94%** post-consumer, **5%** pre-consumer  
Regional: **25 Miles** (Canton, MA)
- Think@ Task Chairs (Steelcase)  
Recycled Content: **13%** post-consumer, **5%** pre-consumer
- Acoustical Ceiling Tile (Armstrong)  
Recycled Content: **8%** post-consumer, **63%** pre-consumer
- Tackboard (NEC/Forbo)  
Recycled Content: **53%** pre-consumer  
Regional: **8 Miles** (Woburn, MA)



Richardson Lab - Room 138  
Photo: Walsh Brothers Incorporated, 2009

## ADDITIONAL RE-

## SOURCES

Harvard Faculty of Arts and Sciences, Herbaria: <http://www.huh.harvard.edu/>

Harvard Faculty of Arts and Sciences Green Program: <http://green.harvard.edu/fas>

Sustainability at the Faculty of Arts and Sciences : <http://green.harvard.edu/fas>

Harvard Green Building Services : <http://green.harvard.edu/green-building-services>

Harvard Green Building Resource : <http://green.harvard.edu/theresource>

