

**HARVARD FACULTY OF ARTS AND SCIENCES  
ZHAUNG LAB RENOVATION**

**LEED-CI v2.0  
GOLD**

NAITO BUILDING, 12 OXFORD ST., CAMBRIDGE, MA 02138

Certified LEED-CI Gold in July 2009, Zhuang Lab is a 3,500 square foot Chemistry Lab, which occupies a portion of both the ground and basement floors in the Naito Laboratory Building at 12 Oxford Street in Cambridge, MA. The Naito Laboratory building, a four-story structure originally constructed in 2000, is one of four buildings that together house all 278,000 sq. ft of laboratories for Harvard's Department of Chemistry and Chemical Biology, and is located within the Cabot Science Complex.



The project was a complete renovation of an existing lab space previously occupied by a different Professor to accommodate the specific needs of Professor Zhuang and her research. The renovated lab now contains Professor Zhuang's office; a secretary's office; work spaces for 12 lab researchers and students; a small kitchenette; four laser labs; a cold room; a dark room; and general lab space.

The project team, led by the Harvard Faculty of Arts and Sciences, Department of Chemistry and Chemical Biology, was committed to sustainability throughout the project, which looked to the Harvard University Green Building Guidelines and the LEED-CI rating system, to guide the selection of materials as well as the mechanical, electrical and plumbing (MEP) systems for the project.

**Laboratory - 034**  
Photo: Ellenzweig, 2009

**PROJECT HIGHLIGHTS**

LEED® Facts

**Zhuang Lab**  
Harvard Faculty of Arts and Sciences  
2008 Renovation



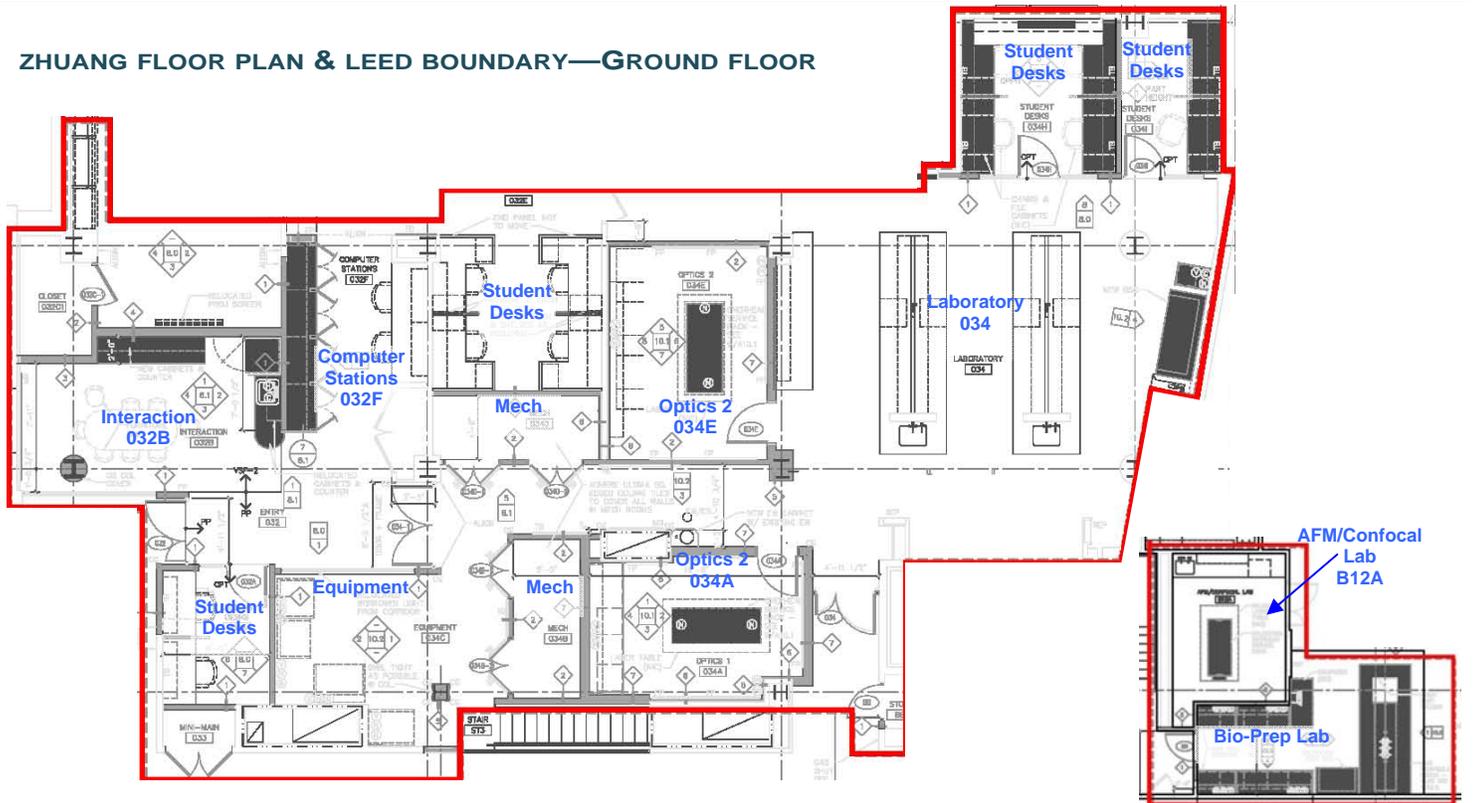
Location.....	Cambridge, Massachusetts
Rating System.....	Commercial Interiors v2.0
Certification Pending.....	<b>Gold</b>
Total Points Achieved.....	<b>32 / 57</b>
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Sustainable Sites.....	4/7
Water Efficiency.....	2/2
Energy and Atmosphere.....	5/12
Materials and Resources.....	4/14
Indoor Environmental Quality.....	12/17
Innovation and Design.....	5/5

- 56%** of the total material value came from materials manufactured within 500 miles of the project site.
- 82%** of the total furniture and furnishings value came from furniture and furnishings REUSED from the original space.
- 41%** of the interior non-structural components were retained as part of the renovation.
- 88%** of the equipment and appliances are Energy Star® rated.
- 100%** of the Lab occupants have task lights to allow individual control of their lighting to suit individual preferences and needs.



## PROJECT OVERVIEW

### ZHUANG FLOOR PLAN & LEED BOUNDARY—GROUND FLOOR



Zhuang Floor Plan & LEED Boundary - Basement



Optics Room

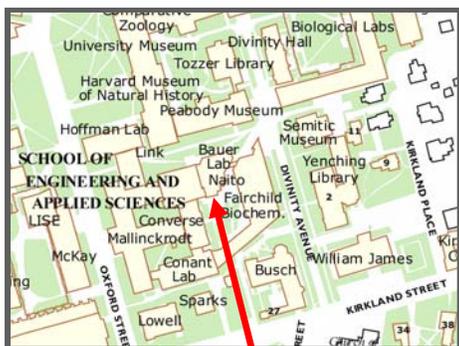
Photo: Jessica Eisenman Parks, Harvard Office for Sustainability. 2009

## PROJECT TEAM

<b>Owner</b>	Harvard Faculty of Arts and Sciences
<b>Project Manager</b>	Harvard University Department of Chemistry and Chemical Biology
<b>Architect</b>	Ellenzweig
<b>Contractor</b>	JBM General Contractors
<b>HVAC Engineer</b>	BR + A Consulting Engineers, LLC
<b>Commissioning Authority</b>	BR + A Consulting Engineers, LLC
<b>Sustainability Consultant</b>	Harvard University, Office for Sustainability Green Building Services



## SITE



**Zhuang Lab, Naito Building**  
12 Oxford Street, Cambridge, MA

- To encourage alternatives to driving, all occupants of the Naito Building have access to Harvard's comprehensive **Commuter-Choice 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 the Harvard Square MBTA stop, several bus lines, and the Harvard University Shuttle.
- Three bicycle racks with a total capacity of 90 bicycles are located ~80 feet from the rear entrance of the Naito Laboratory building for use by the building's occupants. Showers and changing facilities are located on the first floor.
- 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.



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

## WATER EFFICIENCY

Per LEED requirements, if a project boundary does not include bathrooms, calculations must be for the fixtures in the closest bathroom. The closest bathrooms to Zhuang Lab have water efficient fixtures, which **reduce domestic water consumption by 35% over standard EPA 1992 fixtures**. This is the equivalent of saving over 80,000 gallons per year.

### FIXTURES IN ZHUANG PROJECT SCOPE



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

**Grohe Watercare Relaxa®**  
Non-Adjustable Showerhead  
(1.5 gpm)



Differences in the Flush & Flow Rates for EPA 1992 Standard Fixtures and the fixtures installed for the Zhuang Lab Project		
Fixture Type	Zhuang Lab Flush & Flow Rates	EPA 1992 Standard Flush & Flow Rates
Water Closet [GPF]	Dual-Flush 1.6 & 1.1	1.6
Urinal [GPF]	1	1.0
Bathroom Sink [GPM]	0.5	2.5
Shower [GPM]	1.5	2.5
Kitchen Sink	1.5	2.5
GPF - Gallons Per Flush		GPM - Gallons Per Minute



## ENERGY EFFICIENCY

The Faculty of Arts and Sciences (FAS) 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 main goal of this renovation project.

### Mechanical Systems

- **High Performance Fume Hoods** installed as part of the project include 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) instead of 100 feet per minute — reducing air flow by 20% and conserving the energy that would have been required to condition the air.
- **Real-time displays:** Displays have been placed by the lab doors to show the total air flow through the lab, reminding occupants to keep hood sashes closed when not in use.
- **Occupancy sensors:** Occupancy sensors in the offices are tied to the building's control system, allowing temperature settings for heating and cooling to be set back whenever spaces are unoccupied.
- **Commissioning:** The mechanical and electrical systems have been 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) have been purchased from Sterling Planet (wind power) equivalent to 100% of the anticipated electricity use over two years.



**VAV Fume Hood in Zhuang Lab**  
Photo: Harvard Office for Sustainability. 2009

### Electrical Systems

- **Plug Loads:** Energy Star equipment was selected for all newly purchased equipment in the space. This includes office and computer equipment, a refrigerator, and a water cooler, which accounts for 88% of rated power for all Energy Star eligible products.
- **Occupancy Sensors** turn the lights off when sensors have not been activated by motion for set periods of time.
- **Light Fixtures:** Energy-efficient and low-mercury fluorescent lighting fixtures and lamps were carefully chosen and placed to reduce electricity consumption.
- **Task Lights** are installed at all individual student desks and at work stations allowing 100% of occupants to make lighting adjustments to suit individual task needs and preferences. By reducing ambient space lighting levels and providing user controlled, flexible, task specific lighting, the space may reduce heat loads and energy consumption associated with high footcandle levels of indoor, ambient lighting.



**Mechanical Closet**  
Photo: Harvard Office for Sustainability. 2009

## INDOOR ENVIRONMENTAL QUALITY

The FAS 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 (IAQ) During Construction:** The rest of the Naito building maintained occupancy throughout construction. Thus, a comprehensive indoor air quality management plan was implemented to maintain healthy indoor air quality during construction. 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.

**Pre-Occupancy Flush-out** The project included an 11-day flush-out once all construction was complete and furniture installed. The building HVAC system was used to evacuate any remaining contaminants from the renovation/construction process, which is beneficial to occupant health and comfort.

Only Materials with **Low or No VOC Content** were used in the Zhuang Lab 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.

- > **Composite Wood and Laminate Adhesives** used in the renovation do not have any added Urea Formaldehyde
- > **Carpet System** Karastan Contract - FiFi 703 Mignonne Broadloom (*Carpet and Rug Institute's Green Label Plus*) with NU Broadlok Premium Plus Carpet Adhesive (*SCAQMD Rule #1168*)
- > **Adhesives and Sealants and Paints and Coatings** Examples of the products used:

Product Category	Product & Manufacturer	VOC Content (g/l)	VOC Limit (g/l)	Standard
Paints & Coatings	> Eco Spec Interior Latex Eggshell Enamel, Benjamin Moore	0.4	150	Green Seal GS-11
	> Fresh Start All Purpose Primer, Benjamin Moore	49.5	200	SCAQMD Rule #1113
Adhesives & Sealants	> Super 77 Spray Adhesive	51%	65%	Green Seal GS-36
	> Wilsonart Laminate Adhesive	<20	80	SCAQMD Rule #1168

### Construction IAQ measures used on-site

Photos: Harvard Office for Sustainability, 2008



**Pathway Interruption:** MERV 8 Filter installed during construction



**Pathway Interruption:** Isolation of construction area from remainder of building



**HVAC Protection:** Duct equipment sealed with plastic



**Housekeeping:** Materials kept off floor to avoid damage and exposure to moisture



**Laboratory - 034**  
Photo: Ellenzweig, 2009



## MATERIALS & WASTE

Selecting environmentally preferable materials and minimizing the amount of construction waste sent to landfill was important to the project. The project was able to use a large percentage of salvaged office and classroom furniture from storage areas within the Cabot Chemistry Complex. For the additional materials purchased, the project gave preference to low-emitting materials with recycled content and local manufacturing.

**82%** of the total furniture and furnishings budget consisted of salvaged, refurbished or used furniture and furnishings from within the Harvard Chemistry building.

**41%** of the interior, non-structural components within the spaces were retained rather than demolished as part of the renovation.

**56%** of the total material value consists of products salvaged or manufactured locally.

### ENVIRONMENTALLY PREFERABLE MATERIALS IN ZHUANG LAB, NAITO BUILDING

- > 1912 Ultima Ceiling Tile (Armstrong)  
67% pre-consumer, 3% post-consumer
- > Ultra Touch Natural Cotton Fiber Building Insulation (John Manville): 85% pre-consumer
- > Drywall (USG): 95% pre-consumer

#### Examples of regional materials used in project:

Product Name	Manufacturer	Distance between project and manufacturer ( mi)
Millwork	New England Lab	13
Casework/ Student Desks	Young's Woodworking	13
Halcon Gemini Desk Herman Miller Aeron chair Steelcase 900 series lateral files Steelcase Criterion lab stools Soho Laminate Table Davis Zeno Chairs	Salvaged from within the Harvard Cabot Chemistry Complex	0



**Student Desks**

Photo: Office for Sustainability, 2009



**Laboratory - 034**

Photo: Ellenzweig, 2009

## ADDITIONAL RESOURCES

- > Harvard FAS, Dept. of Chemistry and Chemical Biology: <http://www.chem.harvard.edu>
- > Harvard FAS, Green Program: <http://green.harvard.edu/fas>
- > Harvard FAS, Green Labs Program: <http://green.harvard.edu/fas/green-labs>
- > Harvard OFS - Green Building Services: <http://green.harvard.edu/green-building-services>
- > Harvard OFS - Green Building Resource: <http://green.harvard.edu/theresource>

