School of Engineering and Applied Sciences

GREEN is the new Crimson

HARVARD SCHOOL OF ENGINEERING AND APPLIED SCIENCES

VLASSAK LAB - GORDON MCKAY BUILDING

9 OXFORD STREET, CAMBRIDGE, MA 02138

LEED-CIv3.0 PLATINUM

The Vlassak Laboratory is a 2,540 square foot lab, which occupies a portion of the third floor of the Gordon McKay Laboratory Building at 9 Oxford Street in Cambridge, MA. The newly renovated lab will accommodate and enhance the complex research of Professor Joost J. Vlassak, along with his team of undergraduate students, graduate students, postdoc's and technical staff who develop and practice techniques for studying the mechanical behavior of thin films. The new lab will allow the group to address specific subjects and issues within material engineering such as the mechanical behavior of thin metal films, adhesion and delamination of multilayered structures containing low-k dielectrics, thin films of various alloy types, and various thin-film combinatorial approaches to alloy development.

The renovated lab now contains a main lab, a wet lab, an optics lab, storage space, student offices and other private lab spaces.

In support of Harvard University's goal to reduce greenhouse gas emissions 30% below 2006 levels by 2016, inclusive of growth, Harvard School of Engineering and Applied Sciences (SEAS) and the project team were committed to sustainability throughout the duration of the project. This helped to guide decision making and inform the selection of materials, as well as the mechanical, electrical and plumbing (MEP) systems. Ultimately, the Vlassak Laboratory achieved LEED-CIv3.0 Platinum certification.

PROJECT HIGHLIGHTS

LEED® Facts

Vlassak Lab
Harvard School of Engineering & Applied Sciences
2010 Renovation

Location	Cambridge, Massachusetts
Rating System	Commercial Interiors v3.0
Certification	Platinum
Total Points	80/110
Sustainable Sites	15/21
Water Efficiency	6/11
Energy and Atmosphere	30/37
Materials and Resources	5/14
Indoor Environmental Quality	14/17
Innovation and Design	6/6
Regional Priority	4/4

88% of on-site generated construction waste was diverted from landfills.

32% reduction in overall water consumption compared to a code compliant base case.

46% reduction in lighting power density was achieved.

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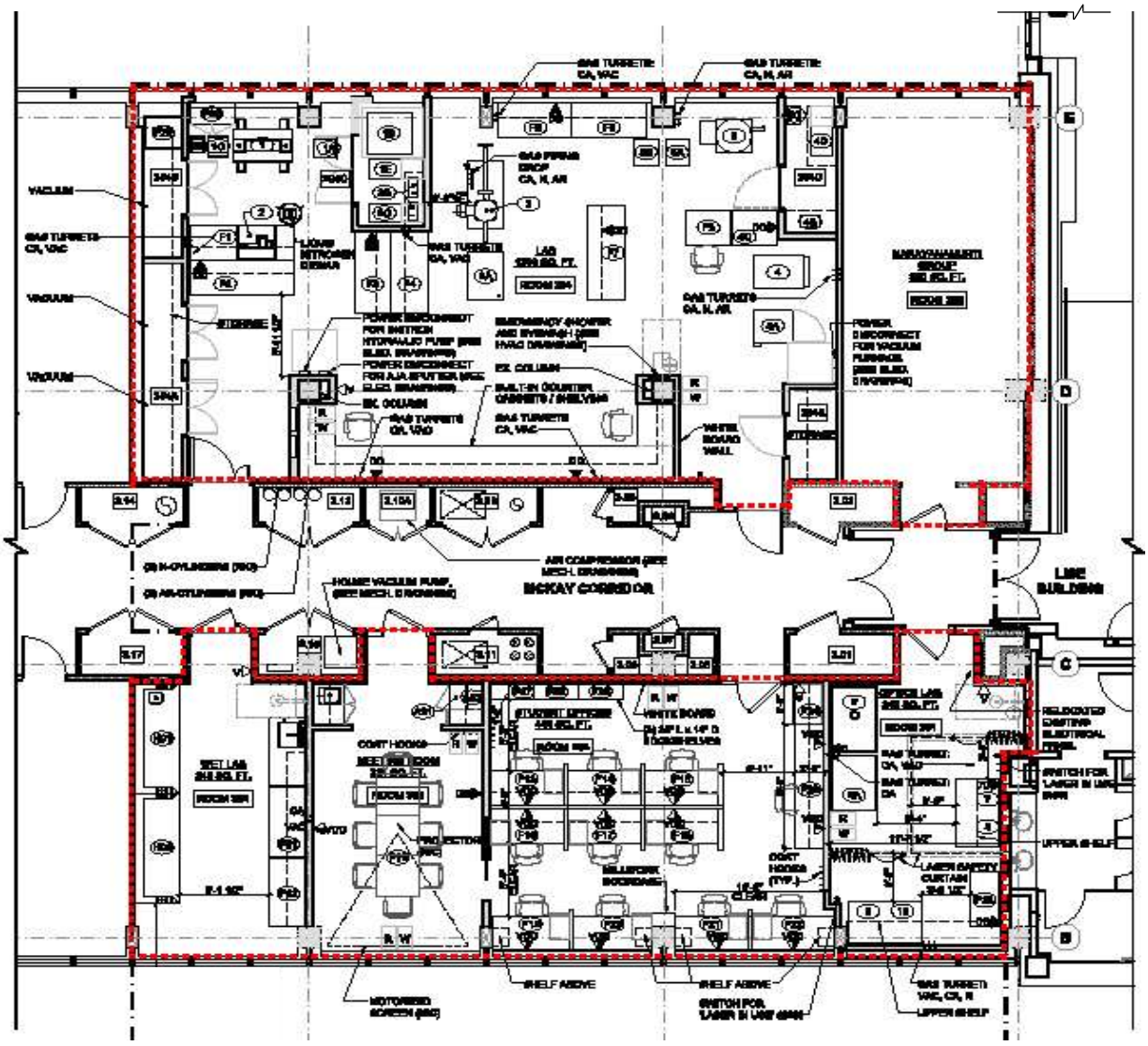
PROJECT OVERVIEW

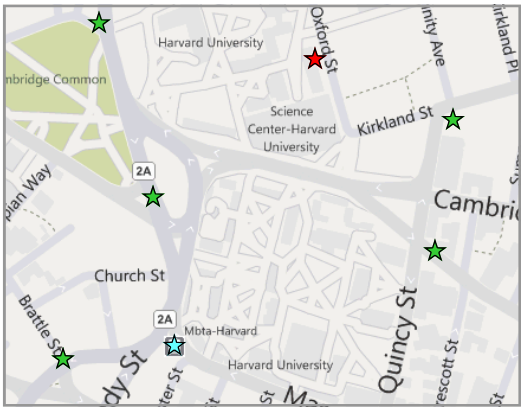


LEED Boundary

PROJECT TEAM

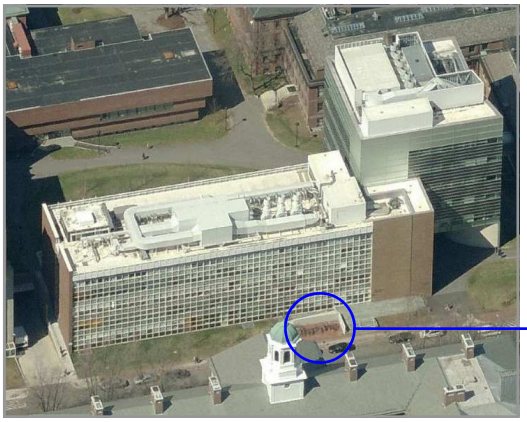
Owner	Harvard University, School of Engineering and Applied Sciences (SEAS)
Project Manager	Don Claflin, SEAS Facilities Manager
Architect	Douglas Okun and Associates
Construction Manager	G. Green Construction CO.
FP/MEP Engineer	R.G. Vanderweil Engineers
Commissioning Agent	Harvard Green Building Services
Sustainability Consultant	Harvard Green Building Services

SITE



★ Gordon McKay Building
☆ MBTA Subway Station
★ Bus Stop Location

- To encourage alternatives to driving, all occupants of Vlassak Lab have access to Harvard's ***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)
- The McKay Building is located in a dense urban area which allows occupants easy access to amenities such as restaurants, banks, churches and retail stores that are within walking distance.
- The building is located within walking distance to the Harvard Square subway station and several bus lines.
- Two existing bicycle racks are accessible to occupants of the McKay Building, providing storage for 20 bicycles. Four shower and changing facilities are located within 200 yards of the building for bicycle commuters.



Gordon McKay Building
Cambridge, MA 02138

Bike Racks at Oxford Street Entrance
Photo: Harvard Green Building Services, 2010

WATER EFFICIENCY

Per LEED requirements, if a project does not include bathrooms, calculations must be for the fixtures in the nearest bathrooms.

Water efficient plumbing fixtures were chosen for all applicable plumbing fixtures within the scope, and are in place at the nearest bathrooms to Vlassak Lab.

Overall, these fixtures reduce domestic water consumption by **32%** over standard EPAct 1992 fixtures.

Differences in the Flush & Flow Rates for EPAct 1992 Standard fixtures and the fixtures utilized by Vlassak Lab Occupants:

Fixture Type	Vlassak Lab Flush & Flow Rates	EPAct 1992 Standard Flush & Flow Rates
Water Closet [GPF]	Dual-Flush 1.6 &1.1	1.6
Bathroom Faucet [GPM]	0.5	1.0
Shower [GPM]	1.5	2.5
Kitchen Faucet [GPM]	1.5	2.5
Urinal [GPF]	0.125	1.0
GPF - Gallons Per Flush		GPM - Gallons Per Minute

SLOAN Dual Flush Handle
(Up 1.1 gallons for half flush and 1.6 gallons for full flush)

Detla Classic Single Handle Faucet
(with 1.5 gallon per minute aerator)

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ENERGY EFFICIENCY

Harvard School of Engineering and Applied Sciences (SEAS) 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 focus.

MECHANICAL SYSTEMS

- **Enthalpy Wheel Energy Recovery:** Exhaust air is run through a heat recovery (enthalpy) wheel, which transfers both heat and moisture to incoming fresh air, reducing the amount of energy needed to condition the air by up to 75%.
- **Demand Control Ventilation:** CO_2 sensors in all high density spaces control the amount of outdoor air supplied. If there are fewer people occupying the space then less air is required, ultimately saving energy.
- **Occupancy and Temperature Sensors:** Occupancy sensors tied to the building's control system modulate the supply air and maintain temperature set-points, allowing both to be set back whenever spaces are unoccupied.
- **Condensing Boiler:** The gas fired boiler is an 88% efficient condensing-type boiler, meaning that heat is recovered from the flue gasses before they are exhausted This is 10% more efficient that the code complaint base case.
- **High Efficiency Chiller:** The York high efficiency air cooled chiller has a Coefficient of Performance of 2.8, which is 3% more efficient than the base case.
- **Premium Efficiency Pumps:** All new pumps are rated by NEMA to be premium efficiency. Pumps that distribute hot water have variable frequency drives, further reducing energy consumption when full load is not required.

ELECTRICAL SYSTEMS

- **Lighting Controls:** A digital addressable lighting interface (DALI) system allows for sweep controls, time of day control, daylight harvesting, off hours zone control, occupancy sensors and dimming.
- **Lighting Fixtures:** Energy-efficient and low-mercury fluorescent lamps were carefully chosen and strategically placed to reduce electricity consumption while maintaining adequate lighting levels for each type of space.
- **Plug Loads:** Energy Star equipment was selected for all new equipment in the space.
- **Commissioning:** The mechanical and electrical systems have been fully commissioned, ensuring that all energy-related systems were installed as designed and operate efficiently prior to occupancy.
- **Renewable Energy:** Renewable Energy Certificates (RECs) were purchased from Sterling Planet (wind power) equivalent to 70% of the anticipated electricity over 2 years.

INDOOR ENVIRONMENTAL QUALITY

SEAS 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 for workers and future occupants. All grills and vents were sealed and ductwork remained sealed until it was installed and covered. Fans were used to exhaust air directly to the outdoors, and building materials were kept sealed and off the grounds until they were installed.

THERMAL COMFORT SURVEY: Occupants will be surveyed about their thermal comfort once per season. The Operations team will adjust the heating or cooling in the project space as needed.

Only Materials with **LOW OR NO VOC CONTENT** were used in the Vlassak Lab Renovation. 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 have no added Urea Formaldehyde.

➤**ADHESIVES AND SEALANTS | PAINTS AND COATINGS** Examples of the products used:

Category	Product & Manufacturer	VOC Content (g/l)	VOC Limit (g/l)	Standard
Paints & Coatings	➤ Benjamin Moore Super Spec HP Prime	51	200	Green Seal GS-11
	➤ Benjamin Moore Latex Eggshell 374	0	150	Green Seal GS-11
	➤ Benjamin Moore Latex Block Filler 285	45	200	Green Seal GS-11
Adhesives & Sealants	➤ Mapei Eco 575	40	50	SCAQMD Rule #1168
	➤ USG Gypsum Board Sealant	15	50	SCAQMD Rule #1168

Construction IAQ Measures Implemented During Construction

Photos: Harvard Green Building Services

HVAC Protection

The contractor sealed all supply and return air openings with plastic during demolition and construction. All new duct work was also sealed prior to installation.

Housekeeping

Cleaning procedures were instituted to control contaminants in building spaces during construction and prior to occupancy. This was implemented by using wetting agents and sweeping compounds to control, minimize and suppress dust.

DAYLIGHT AND VIEWS: To provide a connection between indoor and outdoor environments, **80%** of the regularly occupied spaces have access to daylight and views.

GREEN HOUSEKEEPING: SEAS has made a commitment to using green cleaning processes in all of its buildings, including the Vlassak Laboratory. This includes the use of Green Seal certified cleaning solutions, 100% recycled content toilet tissue and paper towels, portion control chemical dispensers, staff training.

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MATERIALS & WASTE

Selecting environmentally preferable materials and minimizing the amount of construction waste sent to landfill was important in Vlassak Lab. The project team gave preference to low-emitting materials with recycled content and local manufacturing.

16% of the total value of materials used in the project consist of materials with recycled content.

37% of the total material value consists of products salvaged or manufactured locally.

88% of the on-site generated construction waste was diverted from landfills.

ENVIRONMENTALLY PREFERABLE MATERIALS IN VLASSAK LAB

- Wood Doors (Lambton Doors)
  Recycled Content: **75%** pre-consumer
- Door Locks (Assa Abloy)
  Recycled Content: **66%** post-consumer
- Gypsum Board (USG)
  Recycled Content: **94%** pre-consumer, **3%** post-consumer
- Batt Insulation (Certain Teed)
  Recycled Content: **49%** pre-consumer, **19%** post-consumer
- Marker Boards(Skyfold)
  Recycled Content:: **49%** pre-consumer, **12%** post-consumer

Examples of Regional materials used in the project:

Product Name	Manufacturer	Distance (Mi) between project and Manufacturer, Material Extraction	
Light Gauge Framing	Marino/Ware	401	246
Hollow Metal Frames	De LaFontaine	>500	10

ADDITIONAL RESOURCES

- HARVARD SCHOOL OF ENGINEERING AND APPLIED SCIENCES (SEAS): http://seas.harvard.edu/
- SUSTAINABILITY EFFORTS AT SEAS: http://intranet.seas.harvard.edu/audience/sustainability
- HARVARD GREEN BUILDING SERVICES: http://green.harvard.edu/green-building-services
- HARVARD GREEN BUILDING RESOURCE: http://green.harvard.edu/theresource
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