Burton Lab is an approximately 1,500 square foot biochemistry lab located on the 3rd floor of the Harvard Bio Labs Building at 16 Divinity Avenue in Cambridge, Massachusetts. Professor Burton’s study investigates how the cell membrane is involved with protein transports, and centers on the prevention of bacterial health threats.

The laboratory space is part of the Department of Molecular and Cellular Biology and serves as a working space for seven occupants. In addition to the faculty office, the renovation included wet lab space, graduate student seating, a microscope room and an equipment room which accommodates a cold room space.

Sustainability played a strong roll throughout the Burton Lab project, during both design and construction. By understanding the function of the laboratory space, the team was able to identify which components could have the most calculable and beneficial impact on the project. A heavy focus was placed on the reuse of existing elements, as well as the application of sustainable furniture and materials. Energy Star rated equipment played a key role in minimizing the facility’s energy use, as well as careful design of the mechanical and electrical systems. This was amplified by a two years purchase of renewable power through Sterling Planet Green America™ RECs. All of these efforts serve to ensure and promote the importance of sustainable lab practice.

![Burton Wet Lab](Photo: Harvard Office of Sustainability. 2009)

**LEED® Facts**

<table>
<thead>
<tr>
<th>Category</th>
<th>Points Achieved</th>
<th>Rating System</th>
<th>Certification</th>
<th>Location</th>
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<tr>
<td>Indoor Environmental Quality</td>
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<td></td>
<td></td>
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<tr>
<td>Innovation and Design</td>
<td>4</td>
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</tbody>
</table>

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

43% of interior non-structural components were reused.

90% Of regularly occupied areas have access to exterior views.

100% of the equipment and appliances are Energy Star® rated.

The lighting settings 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

PROJECT TEAM

Owner:
Harvard Faculty of Arts and Sciences

Project Manager:
FAS Capital Projects

Architect:
Perkins + Will

Contractor:
Shawmut Design and Construction

Lighting Engineer:
Rist-Frost-Shumway Engineering

HVAC Engineer:
Rist-Frost-Shumway Engineering

Commissioning Authority:
Rist-Frost-Shumway Engineering

Sustainability Consultant:
Harvard University, Office for Sustainability
Green Building Services

Please print this project profile only if necessary.
If printing is required, please print double sided and recycle when finished. Thank you!
To encourage alternatives to driving, all occupants of Burton Lab, as well as the BioLabs Building, 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)

The building is located within walking distance to the Harvard Square MBTA stop, several bus lines, and the Harvard University Shuttle.

The BioLabs building provides bicycle racks with storage for 32 bicycles at the building entrance, with one shower and changing facility located in the basement of the building. Two additional facilities are located 85 yards away on the fourth floor of the Herbaria Building.

### PUBLIC TRANSPORTATION

The BioLabs Building is located within a quarter mile of 5 MBTA bus stops and 2 Harvard shuttle bus stops. The building is located in a dense urban area with several services, which allows occupants to walk and easily access amenities such as restaurants, parks, churches, and daycares.

<table>
<thead>
<tr>
<th># on Map</th>
<th>Service Name or Bus Stop</th>
<th>Distance From Site</th>
<th>Line Name/ Number or Service type</th>
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<tbody>
<tr>
<td>1</td>
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<tr>
<td>2</td>
<td>Kirkland St &amp; Summer Rd.</td>
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<tr>
<td>3</td>
<td>Kirkland St &amp; Quincy St.</td>
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<tr>
<td>4</td>
<td>Kirkland St &amp; Towbridge St.</td>
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<tr>
<td>5</td>
<td>Cambridge St @ Prescott St</td>
<td>0.23</td>
<td>69</td>
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<tr>
<td>A</td>
<td>Memorial Hall</td>
<td>0.15</td>
<td>Quad Express and Mather Express</td>
</tr>
<tr>
<td>B</td>
<td>Maxwell Dworkin</td>
<td>0.12</td>
<td></td>
</tr>
<tr>
<td>α</td>
<td>Harvard Yard Child Care Center</td>
<td>0.07</td>
<td>Daycare</td>
</tr>
<tr>
<td>β</td>
<td>Church of the New Jerusalem</td>
<td>0.2</td>
<td>Place of worship</td>
</tr>
<tr>
<td>γ</td>
<td>Queens Head pub</td>
<td>0.19</td>
<td>Restaurant</td>
</tr>
<tr>
<td>δ</td>
<td>Shady Hill Square</td>
<td>0.25</td>
<td>Park</td>
</tr>
</tbody>
</table>
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 the renovation project.

MECHANICAL SYSTEMS

All control points, space temperatures and set-points for Burton Lab are mapped to the facility’s Building Automation System (BAS), which uses space conditions in its various energy management strategies, and adjusts the central HVAC system operations to match overall building loads. The local systems are then controlled to avoid simultaneous heating and cooling. Program spaces in Burton Lab operate individually on an occupied/unoccupied scenario to allow for the reduction of exhaust and makeup air rates.

- **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. The system monitors all carbon dioxide (C02) sensors throughout the building and modulates the air handling unit return, exhaust and outdoor air dampers, as required, to maintain the C02 set-point for demand control ventilation.

- **Occupancy-Based Ventilation**: Occupancy sensors are used to allow for the reduction of exhaust and makeup air rates.

- **Set-backs**: Where allowed by use, set-backs reset the space’s temperature in increments of 2 degrees Fahrenheit per hour, up to a total of 4 degrees Fahrenheit above set-point in the cooling mode or below set-point in the heating mode.

- **Heat Recovery**: A heat recovery unit was added to the air handling unit to increase outdoor air ventilation from 25% of total air volume to 50% of total air volume.

- **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. This effort prevents over 18,000 pounds of CO2 from entering our atmosphere.

ELECTRICAL SYSTEMS

- **Occupancy Sensors**: Duel technology daylight and occupancy responsive control sensors turn lights off when not activated by motion for a set period of time.

- **Daylight Sensors**: Adjustable daylight sensing to prevent light fixture use when ambient light levels exceed the required light levels in the space.

- **Light Fixtures**: Energy-efficient fluorescent light fixtures and lamps were carefully chosen and placed to reduce electricity consumption.

- **Plug Loads**: 100% of the eligible equipment, including 10 computers, a scanner and a printer, are Energy Star® rated for power savings.
**Indoor Environmental Quality**

The Harvard University 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 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.

**Temperature and Lighting Control:** To promote productivity, comfort and wellbeing, thermostats and control units are installed within tenant spaces and lighting controls enable 90% of the occupants to suit individual needs.

**Daylight and Views:** In 90% of the regularly occupied spaces, occupants have a direct line of sight to the outside, providing a connection between indoor and outdoor environments.

Only Materials with Low or No VOC Content were used in the Burton 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:** There is no added Urea Formaldehyde in any of the products used in the Burton Lab renovation.
- **Systems Furniture and Seating:** The Herman Miller Aside Chair meets the requirements of both GREENGUARD® Certification and BIFMA X7.1-2005, CIR dated 9/20/2006
- **Paint and Coatings | Adhesives and Sealants:** All interior paints used in the project have low or

<table>
<thead>
<tr>
<th>Product Category</th>
<th>Product &amp; Manufacturer</th>
<th>VOC Content (g/l)</th>
<th>VOC Limit (g/l)</th>
<th>Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Paints &amp; Coatings</strong></td>
<td>Benjamin Moore EcoSpec Interior Latex Primer</td>
<td>0.0</td>
<td>150.0</td>
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<td></td>
<td>Benjamin Moore EcoSpec Interior Latex Flat</td>
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<td></td>
<td>Benjamin Moore Sweep Up Spray Latex</td>
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<td><strong>Adhesives &amp; Sealants</strong></td>
<td>Maipei - Eco 575 Adhesive</td>
<td>0.0</td>
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<td>SCAQMD Rule #1168</td>
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<td></td>
<td>Armstrong S-760</td>
<td>5.0</td>
<td>50.0</td>
<td>SCAQMD Rule #1168</td>
</tr>
</tbody>
</table>

**Source Control:** Enamel with Low VOC content

**Pathway Interruption:** Exhaust filtered and direct to outside

**Housekeeping:** Ductwork sealed after installation

Photos: Harvard Office for Sustainability, 2009
### Materials and Waste

Selecting environmentally preferable materials and minimizing the amount of construction waste sent to landfill was important to the project. For the additional materials purchased, the project gave preference to low-emitting materials with recycled content and locally manufactured.

- **90%** of the construction waste was diverted from landfills.
- **8%** of the total material value consists of post-consumer and/or pre-consumer recycled content materials.
- **43%** of the total material salvaged from original building were reused.

### Environmentally Preferable Materials in Harvard University Burton Lab

<table>
<thead>
<tr>
<th>Material Description</th>
<th>Recycled Content Details</th>
<th>Regional Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Steel Casework (Fisher Hamilton)</td>
<td>Recycled Content: 10% post-consumer, 15% pre-consumer.</td>
<td></td>
</tr>
<tr>
<td>HM Frames (de La Fontaine)</td>
<td>Recycled Content: 25% post-consumer, 7% pre-consumer. Regional: 211 Miles (Sherbrooke, Quebec, CA)</td>
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</tr>
<tr>
<td>Marmorette Linoleum (Armstrong)</td>
<td>Recycled Content: 35% pre-consumer</td>
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</tr>
<tr>
<td>UltraSteel Metal Studs (Dietrich)</td>
<td>Recycled Content: 37% post-consumer, 17% pre-consumer. Regional: 34 Miles (Lunenburg, MA)</td>
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</tr>
<tr>
<td>Sheetrock GWB (USG)</td>
<td>5% post-consumer, 94% pre-consumer</td>
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</tr>
<tr>
<td>Fiberglass Batt Insulation (Certainteed)</td>
<td>100% pre-consumer. Regional: 3 Miles (Mountain Top, PA)</td>
<td></td>
</tr>
</tbody>
</table>

### Additional Resources

- Harvard University Department of Molecular and Cellular Biology: [http://www.mcb.harvard.edu/](http://www.mcb.harvard.edu/)
- Harvard University Faculty of Arts and Sciences: [http://www.fas.harvard.edu/home/](http://www.fas.harvard.edu/home/)
- FAS Green Labs Program: [http://green.harvard.edu/fas/labs](http://green.harvard.edu/fas/labs)
- Sterling Planet: [http://www.sterlingplanet.com](http://www.sterlingplanet.com)