HARVARD
Faculty of Arts and Sciences

HARVARD UNIVERSITY | Sustainability

FAS Tozzer Anthropology Building
21 Divinity Ave, Cambridge, MA 02138
Project Profile

LEED Rating System v2009
LEED Gold
May 2014

The Harvard Faculty of Arts and Sciences (FAS) renovation of Tozzer Library involved a complete gut renovation of the existing 26,000 square foot library. The project scope also added a 10,000 square foot fourth floor which provides additional floor area for office space and new mechanical systems. The original building was designed in 1974 by Johnson and Hodvelt and served as a library for anthropology and anthropologic research. The new building's lower two floors accommodate the Tozzer Library offices, reading rooms, library stacks, special collections area, and library support services. A skylight brings daylight into an atrium through the upper levels. The upper levels consist of classrooms, faculty offices, and graduate student offices for the Department of Anthropology. Also, alterations were completed around the building to improve stormwater management.

Photo: copyright Kennedy & Violich Architecture, 2014

In setting the sustainability goals to guide the project's design and operation, the project team utilized the Harvard University Green Building Standards and the LEED-CI v2009 Certification requirements. The main sustainability goals for the project include the following:

- **Reduce energy consumption** by 30% below ASHRAE 90.1-2007
- **Reduce energy demand** by setting up a Demand Response Program
- **Enhance occupant comfort** by providing window treatments to reduce glare and solar heat gain

LEED® Facts

Harvard University
FAS Tozzer Anthropology Building

Location	Cambridge, MA
Rating System	LEED - v2009
Certification Anticipated	Gold
Total Points Anticipated	76/110
Sustainable Sites	21/26
Water Efficiency	3/10
Energy and Atmosphere	26/35
Materials and Resources	7/14
Indoor Environmental Quality	10/15
Innovation and Design	6/6

Project Metrics

38% reduction in water consumption when compared to an EPAct 1992 baseline

53% anticipated energy cost savings when compared to an ASHRAE 90.1-2007 Appendix G baseline energy model

22% of total materials cost which consisted of recycled content

95% of construction waste diverted from landfill

PROJECT HIGHLIGHTS

Photo: copyright Kennedy & Violich Architecture, 2014

Photo: copyright Kennedy & Violich Architecture, 2014

Photo: copyright Kennedy & Violich Architecture, 2014

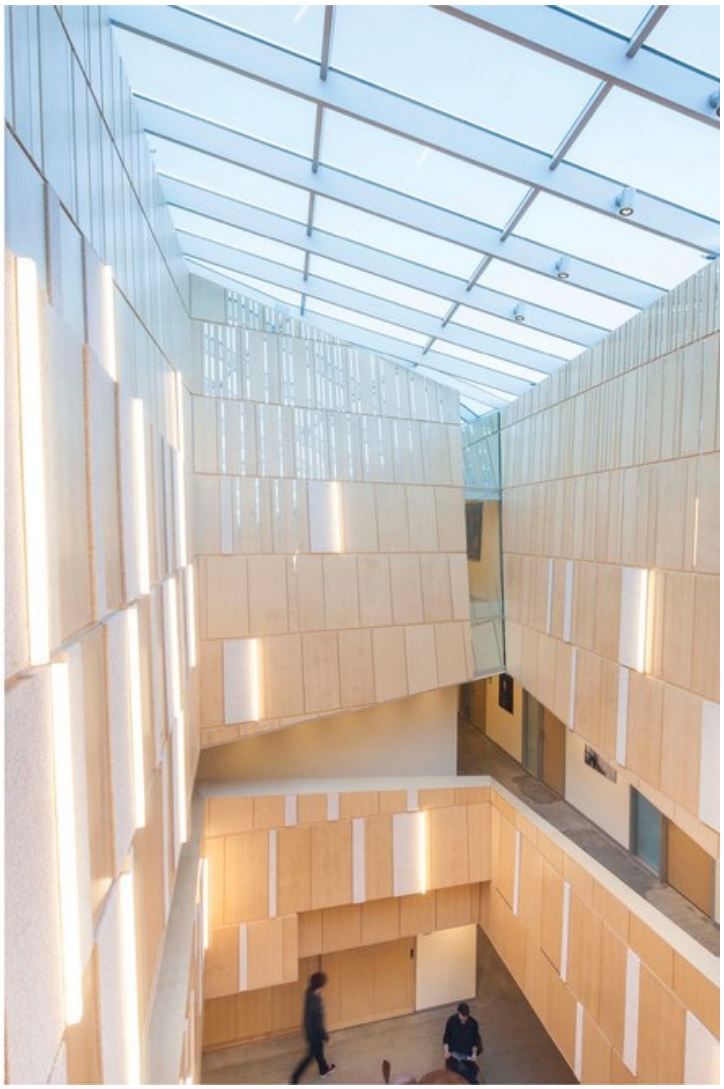


Photo: copyright Kennedy & Violich Architecture, 2014

PROJECT TEAM

Owner	Harvard Faculty of Arts and Sciences
Project Manager	John Hollister, FAS
Planning	Celia Kent and Nazarea Cooper, FAS
Architect	Kennedy & Violich Architecture
MEP Engineer	Buro Happold
Contractor	Consigli Construction Co.
Commissioning Authority	Harvard Green Building Services, BR+A, SGH
Sustainability Consultant	Harvard Green Building Services

ENERGY EFFICIENCY AND INDOOR ENVIRONMENTAL QUALITY

MECHANICAL AND ELECTRICAL SYSTEMS

ECM 1: Chilled beam HVAC system

ECM 2: Enthalpy Recovery Wheel

ECM 3: Energy Efficient Lighting

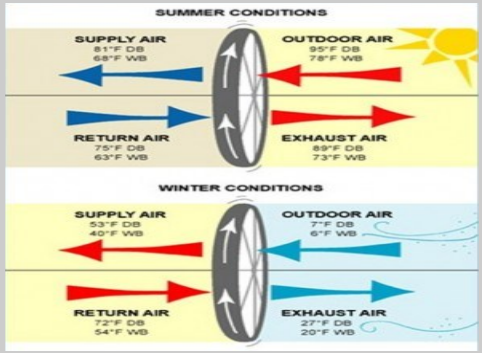
ECM 4: Occupancy Sensors

ECM 5: Energy Efficient Building Envelope

The overall strategy of the HVAC system design was to reduce energy use through the installation of a more energy efficient active chilled beam system. Chilled beam systems differ from traditional HVAC systems in that these systems provide heating and cooling via water rather than air. Active chilled beam systems are able to both heat and cool a building using less energy due to the fact water is a more efficient medium of delivery energy throughout a building.

Tozzer's lighting design and lighting controls strategy are also very energy efficient. The installed lighting power density at Tozzer is 25% below code allowance. Lighting controls were installed throughout the building including occupancy sensors in all of the office spaces and conference rooms, and daylight dimming sensors were installed in the Library reading areas.

Overall, the Tozzer Anthropology Building is expected to consume 53% less energy than a baseline energy model which is compliant with ASHRAE Standard 90.1-2007, Appendix G. Measurement and verification will be performed by Harvard Green Building Services to verify whether these energy savings are realized.



Typical energy exchange through an enthalpy wheel: Copyright DAC Sales (www.dachvac.com/energy-recovery/energy-recovery-wheels-what-is-an-enthalpy-wheel/), 2012

Photo: copyright John Hollister, 2014

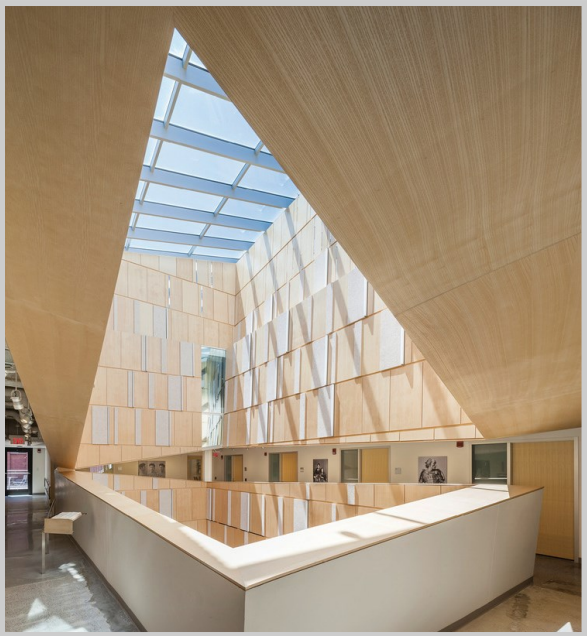


Photo: copyright Kennedy & Violich Architecture, 2014

INDOOR ENVIRONMENTAL QUALITY

The high indoor environmental quality of the Tozzer Library was a significant focus for the project. The selection of low chemical emitting building materials and finishes was a point of emphasis during the design and procurement phase of the project in order to prevent unwanted chemicals from entering the building occupant breathing zones. Concurrent with that, appropriate construction measures to prevent mold and mildew growth within the building helped ensure a high level of indoor air quality is available once the building was occupied. All chemical mixing rooms have auto closing doors as well as required room exhaust to ensure chemical fumes do not enter into adjacent spaces.

Other strategies to enhance the indoor environment quality were implemented into the building infrastructure. These included:

- MERV 13 filters on all HVAC units providing ventilation air
- Daylight access and views
- High efficiency lighting with appropriate light levels
- Occupancy sensors and controls

PLUMBING SYSTEMS AND POTABLE WATER USE REDUCTION

1.28 GPF Toilet: Copyright American Standard, 2012

0.125 GPF Urinal: Copyright American Standard, 2012

Decreasing the demand for potable water is the first step towards sustainable water management. Sinks, toilets, urinals, showers, and irrigation systems designed to use less water than code compliant fixtures are widely available; and when combined with conscientious occupant use patterns and controls, can result in a large reduction in potable water consumption. Some of the water conservation strategies incorporated in the project include:

- Low-flow plumbing fixtures
  - Urinals: 0.125 GPF
  - Toilets: 1.28 GPF
  - Lavatory faucets: 0.5 GPM

These strategies led to a 38% reduction in water use when compared to the EPAct 1992 baseline.

PRODUCTS AND MATERIALS

MDF Premium Arries Sierra Pine

- 92% post -consumer recycled content
- 100% FSC wood content
- No added urea formaldehyde

Vesta Particleboard Flakeboard

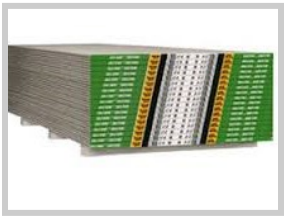
- 52% post -consumer recycled content
- 100% regional
- materials
- No added urea formaldehyde

Benjamin Moore Paint

- Low VOCs

Scofield Floor Coating

- No VOCs



Gypsum Sheathing

- 95% pre -consumer recycled content
- 95% regional materials

HB Fuller Carpet Pad Adhesive

- No VOCs

KEY HIGHLIGHTS

22% recycled content value as a percentage of total material cost

96% certified wood value as a percentage of new wood materials cost

95% total percentage of construction waste diverted from landfill

100% of all paints and sealants have low VOC content

12% regional materials value as a percentage of total materials cost

Please note that while many products are described in this project profile, these are provided for informational purposes only, to show a representative sample of what was included in this project. Harvard University and its affiliates do not specifically endorse nor recommend any of the products listed in this project profile and this profile may not be used in commercial or political materials, advertisements, emails, products, promotions that in any way suggests approval or endorsement of Harvard University.

PROJECT SCORECARD

LEED FOR NEW CONSTRUCTION & MAJOR RENOVATIONS (V2009)

ATTEMPTED: 78, DENIED: 2, PENDING: 0, AWARDED: 76 OF 110 POINTS

leed-nc

SUSTAINABLE SITES — 21 OF 26

SSp1	Construction Activity Pollution Prevention	Y
SSc1	Site Selection	1 / 1
SSc2	Development Density and Community Connectivity	5 / 5
SSc3	Brownfield Redevelopment	1 / 1
SSc4.1	Alternative Transportation-Public Transportation Access	6 / 6
SSc4.2	Alternative Transportation-Bicycle Storage and Changing Room	0 / 1
SSc4.3	Alternative Transportation-Low-Emitting and Fuel-Efficient V	3 / 3
SSc4.4	Alternative Transportation-Parking Capacity	2 / 2
SSc5.1	Site Development-Protect or Restore Habitat	0 / 1
SSc5.2	Site Development-Maximize Open Space	1 / 1
SSc6.1	Stormwater Design-Quantity Control	1 / 1
SSc6.2	Stormwater Design-Quality Control	1 / 1
SSc7.1	Heat Island Effect, Non-Roof	0 / 1
SSc7.2	Heat Island Effect-Roof	0 / 1
SSc8	Light Pollution Reduction	0 / 1

WATER EFFICIENCY — 3 OF 10

WEp1	Water Use Reduction, 20% Reduction	Y
WEc1	Water Efficient Landscaping	0 / 4
WEc2	Innovative Wastewater Technologies	0 / 2
WEc3	Water Use Reduction	3 / 4

ENERGY AND ATMOSPHERE — 26 OF 35

EAp1	Fundamental Commissioning of the Building Energy Systems	Y
EAp2	Minimum Energy Performance	Y
EAp3	Fundamental Refrigerant Mgmt	Y
EAc1	Optimize Energy Performance	19 / 19
EAc2	On-Site Renewable Energy	0 / 7
EAc3	Enhanced Commissioning	2 / 2
EAc4	Enhanced Refrigerant Mgmt	0 / 2
EAc5	Measurement and Verification	3 / 3
EAc6	Green Power	2 / 2

MATERIALS AND RESOURCES — 7 OF 14

MRp1	Storage and Collection of Recyclables	Y
MRc1.1	Building Reuse-Maintain Existing Walls, Floors and Roof	1 / 3
MRc1.2	Building Reuse, Maintain 50% of Interior	0 / 1
MRc2	Construction Waste Mgmt	2 / 2
MRc3	Materials Reuse	0 / 2
MRc4	Recycled Content	2 / 2

MATERIALS AND RESOURCES — CONTINUED

MRc5	Regional Materials	1 / 2
MRc6	Rapidly Renewable Materials	0 / 1
MRc7	Certified Wood	1 / 1

INDOOR ENVIRONMENTAL QUALITY — 10 OF 15

IEQp1	Minimum IAQ Performance	Y
IEQp2	Environmental Tobacco Smoke (ETS) Control	Y
IEQc1	Outdoor Air Delivery Monitoring	1 / 1
IEQc2	Increased Ventilation	1 / 1
IEQc3.1	Construction IAQ Mgmt Plan-During Construction	1 / 1
IEQc3.2	Construction IAQ Mgmt Plan-Before Occupancy	0 / 1
IEQc4.1	Low-Emitting Materials-Adhesives and Sealants	1 / 1
IEQc4.2	Low-Emitting Materials-Paints and Coatings	1 / 1
IEQc4.3	Low-Emitting Materials-Flooring Systems	1 / 1
IEQc4.4	Low-Emitting Materials-Composite Wood and Agrifiber Products	1 / 1
IEQc5	Indoor Chemical and Pollutant Source Control	0 / 1
IEQc6.1	Controllability of Systems-Lighting	1 / 1
IEQc6.2	Controllability of Systems-Thermal Comfort	0 / 1
IEQc7.1	Thermal Comfort-Design	1 / 1
IEQc7.2	Thermal Comfort-Verification	1 / 1
IEQc8.1	Daylight and Views-Daylight	0 / 1
IEQc8.2	Daylight and Views-Views	0 / 1

INNOVATION IN DESIGN — 6 OF 6

IDc1.1	Innovation in Design	0 / 1
IDc1.1	Exemplary Performance: Construction Waste Mgmt	1 / 1
IDc1.2	Innovation in Design	0 / 1
IDc1.2	Innovation in Design: Occupant Education	1 / 1
IDc1.3	Innovation in Design	0 / 1
IDc1.3	Low Mercury Lighting	1 / 1
IDc1.4	Exemplary Performance: Public Transportation Access	1 / 1
IDc1.4	Innovation in Design	0 / 1
IDc1.5	Exemplary Performance - Maximize Open Space	1 / 1
IDc1.5	Innovation in Design	0 / 1
IDc2	LEED® Accredited Professional	1 / 1

REGIONAL PRIORITY CREDITS — 3 OF 4

SSc3	Brownfield Redevelopment	1 / 1
SSc6.1	Stormwater Design-Quantity Control	1 / 1
SSc7.1	Heat Island Effect, Non-Roof	0 / 1
SSc7.2	Heat Island Effect-Roof	0 / 1
EAc2	On-Site Renewable Energy	0 / 1
MRc1.1	Building Reuse-Maintain Existing Walls, Floors and Roof	1 / 1

TOTAL — **76 OF 110**

MORE INFORMATION

- Tozzer Library: http://hcl.harvard.edu/libraries/tozzer/
- FAS Sustainability: http://green.harvard.edu/schools-units/arts-sciences-fas
- Harvard - Green Building Resource: http://green.harvard.edu/theresource
- Harvard - Green Building Services: http://energyandfacilities.harvard.edu/project-technical-support