HARVARD
Faculty of Arts and Sciences

GREEN
is the new Crimson

Leverett House - McKinlock Hall
58 Plympton Street , Cambridge, MA
Project Profile

LEED NC v2009
LEED GOLD
2015

McKinlock Hall is the second House to undergo renovation as part of House Renewal project at Harvard University. The House Renewal project consists of the renovation of the twelve undergraduate dormitories. It began in 2007 and is anticipated to take over 15 years. The purpose of this renovation is to upgrade the facility to meet current code, accessibility, and sustainability standards with the goal of allowing it to meet the needs of the university for the coming 75 years.

The project team took a close look at the sustainable measures implemented as part of the Stone Hall project (the first project as part of House Renewal) and adopted several strategies including rainwater collection to supplement irrigation; efficient wall and roof insulation; and replacing single-paned windows with double-paned. In addition, the project built upon those strategies implemented in Stone Hall and created an estimated 10% more efficient building.

LEED® Facts

Harvard University
Leverett House - McKinlock Hall

Location……………………………….Cambridge, MA
Rating System…………………………....LEED-NCv3
Certification Anticipated…………………………….Gold
Total Points Anticipated……………………….62/110

Sustainable Sites………………………………….17/21
Water Efficiency……………………………………..8/11
Energy and Atmosphere………………………….20/37
Materials and Resources…………………………...4/14
Indoor Environmental Quality…………………… 5/17
Innovation and Design……………………………...5/6
Regional Priority……………………………………...3/3

Project Metrics

44%	reduction in water use below EPAct 1992 baseline
45%	reduction in energy use below ASHRAE 90.1-2007
93%	of the existing walls, floors, and roof were reused
81%	construction and demolition waste diverted from landfills

PROJECT HIGHLIGHTS - VARIABLE REFRIGERANT FLOW

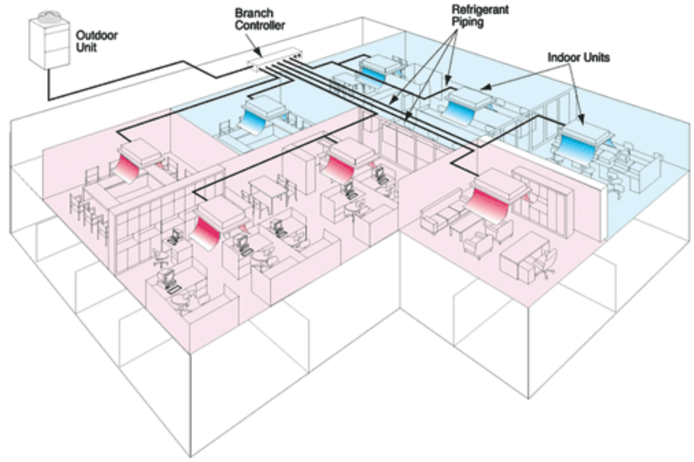

Photo courtesy of Mitsubishi Electric

A variable refrigerant flow (VRF) system is a type of energy efficient mechanical system that provides heating, cooling, and/or ventilation. The system consists of five main components: a condenser, compressor, branch controller, refrigerant, and evaporator(s). One of the advantages of VRF systems over traditional mechanical systems is the size of the refrigerant lines are much smaller than ductwork. This is particularly helpful in existing building such as McKinlock Hall where existing conditions made it difficult to locate ductwork.

The compressor motor in a VRF system is a variable speed. This enables the system to efficiently perform when only part of the load is required. If the system is in heating mode, then the condenser takes in heat energy from the outside air, transfers it to the refrigerant medium, the branch controller distributes the refrigerant to evaporator units located in the interior spaces, and the heat energy is used to heat the spaces. In cooling, the opposite occurs—the evaporators absorb heat energy and the condenser rejects the heat energy outside the building. VRF systems deliver the precise amount of refrigerant to where it's needed. Therefore, it's ideal over traditional reheat system where energy is wasted to reheat cool air. Some systems also has the capability to transfer heat from one zone to another if heating is required in one zone and cooling is required in another, or visa versa. The refrigerant bypasses the condenser and the branch controller redistributes the refrigerant to where heating or cooling is required. This saves energy that would typically be used to run the condenser.

VRF systems are ideal for multi-family units, schools, and office buildings where zoning control is required. VRF systems aren't ideal for spaces that require 100% outside air or spaces with high latent loads. VRF systems were used in electrical, intermediate distribution frame (IDF), and main distribution frame (MDF) rooms as part of the McKinlock Hall project. Low ambient kits allow the system to operate at 100% cooling capacity at reduced outdoor temperatures, which is particularly important in these types of spaces where there is a high heat concentration throughout the year.

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Photo: copyright Vanderwarker, 2014

PROJECT TEAM

Project Manager	Harvard Planning and Project Management
Architect	Kieran Timberlake Architects
Landscape Architect	Stephen Stimson Associates
MEP Engineer	BVH Integrated Services
Environmental Design Lighting Consultant	Atelier Ten
Contractor	Dimeo Construction Company
Commissioning Authority	Jacobs Engineering
Sustainability Consultant	Harvard Green Building Services

ENERGY EFFICIENCY AND INDOOR ENVIRONMENTAL QUALITY

ENERGY EFFICIENCY

ECM 1: Demand Control Ventilation
Demand control ventilation (DCV) is a strategy that modulates the amount of outside air provided to a space based on CO2 levels. This reduces the unnecessary heating and cooling of incoming outside air when outside air isn't required.

ECM 2: Exhaust Air Heat Recovery
High performance enthalpy heat recovery wheels are in all 100% outside air units and energy recovery ventilators are in toilet cores to recover heat from toilet exhaust.

ECM 3: Fan Coils Units with Electronically Controlled Motors
Electronically controlled motors (ECM) are more efficient than traditional PSC motors, require less maintenance due to a soft start and stop, and the life of an ECM is more than twice that of a traditional PSC motor. The fan coil units in this project have ECMs.

ECM 4: Occupancy Sensors
Occupancy sensors are installed in common spaces to turn off the lights and setback room temperatures when spaces are unoccupied. This helps save lighting, heating, cooling, and ventilation energy.

ECM 5: Displacement Ventilation
Displacement ventilation is a more efficient strategy than traditional mixing ventilation because displacement ventilation systems have higher supply air temperatures, reduce thermal loads by stratifying room air, and have increased economizer usage due to higher supply air temperatures. Displacement ventilation is used in the dining halls, common rooms, and theater.

Photo: copyright Vanderwarker, 2014

Photo: copyright Vanderwarker, 2014

INDOOR ENVIRONMENTAL QUALITY

IAQ 1: Demand Control Ventilation
Exposure to elevated levels of CO2 has a number of negative effects on the human body including difficulty concentrating, increased heart rate, and breathing issues. Demand control ventilation is a mechanical system control strategy that increases the amount of outside air provided to a space in order to dilute elevated levels of CO2.

IAQ 2: Displacement Ventilation
High ceilings (typically 9' or higher) are characteristic of displacement ventilation systems and allow for the air to stratify such that the pollutants are concentrated above the breathing zone resulting in a heathier indoor environment.

IAQ 3: Low Emitting Materials
The selection of low chemical-emitting construction and finish materials was an important driving force in the design phase. The project includes low VOC adhesives, sealants, paints, coatings, and primers. All wood and agrifiber products are also free of urea-formaldehyde.

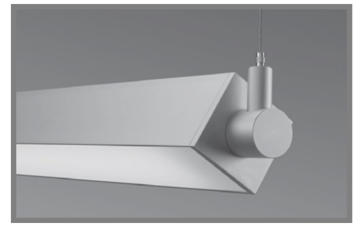
PRODUCTS AND MATERIALS

LIGHTING AND CONTROLS

- **40% reduction** in lighting power density (watts/square foot)

Definity PAR30 HO
Lighting Science
- ✓ LED Lamp
- ✓ Total fixture wattage = 18 watts
- ✓ Life: 50,000 hours

LED Downlight
BK Lighting
- ✓ LED Fixture
- ✓ Total fixture wattage = 8 Watts
- ✓ Life: 50,000 hours



Square Linear Fluorescent
Birchwood lighting
- ✓ High Efficiency Fluorescent
- ✓ Total fixture wattage = 56 Watts
- ✓ Life: 30,000 hours
- ✓ Low mercury content: 1.8 mg

ENERGY EFFICIENT APPLIANCES & WATER EFFICIENCY

- **44% reduction** in annual water use when compared to EPAct 1992 baseline standard.

Dual-Flush Flushometer
Model WES-111
Sloan
- ✓ **1.28 gallons per flush (average)** vs. EPAct baseline of 1.6 gpf.

Electronic Faucet
Model #116.101
Chicago Faucets
- ✓ **0.1 gallons per flush (average)** vs. EPAct baseline of 0.25 gpf.

Shower
Model #1-100
Symmons
- ✓ **1.75 gallons per minute (gpm)** vs. EPAct baseline of 2.5 gpm.

LOW-EMITTING MATERIALS

- **100%** of the project's adhesives, sealants, paints, coatings, and engineered wood are **low-emitting.**

Non-flat Paint
Speedhide Zero Semi-Gloss
PPG
- ✓ No VOCs

Architectural Sealant
Hydro Ban
Laticrete
- ✓ No VOCs

Engineered Wood
VESTA FR ULEF
Flakeboard
- ✓ Meets CARB Phase II for ultra low emitting formaldehyde products

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.

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PROJECT SCORECARD

SUSTAINABLE SITES		17 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	0 / 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	0 / 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		8 OF 10
WEp1	Water Use Reduction-20% Reduction	Y
WEc1	Water Efficient Landscaping	4 / 4
WEc2	Innovative Wastewater Technologies	0 / 2
WEc3	Water Use Reduction	4 / 4

ENERGY AND ATMOSPHERE		20 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	13 / 19
EAc2	On-Site Renewable Energy	0 / 7
EAc3	Enhanced Commissioning	2 / 2
EAc4	Enhanced Refrigerant Mgmt	2 / 2
EAc5	Measurement and Verification	3 / 3
EAc6	Green Power	0 / 2

MATERIALS AND RESOURCES		4 OF 14
MRp1	Storage and Collection of Recyclables	Y
MRc1.1	Building Reuse-Maintain Existing Walls, Floors and Roof	2 / 3
MRc1.2	Building Reuse - Maintain 50% of Interior Non-Structural Ele	0 / 1
MRc2	Construction Waste Mgmt	2 / 2
MRc3	Materials Reuse	0 / 2
MRc4	Recycled Content	0 / 2

MATERIALS AND RESOURCES		CONTINUED
MRc5	Regional Materials	0 / 2
MRc6	Rapidly Renewable Materials	0 / 1
MRc7	Certified Wood	0 / 1

INDOOR ENVIRONMENTAL QUALITY		5 OF 15
IEQp1	Minimum IAQ Performance	Y
IEQp2	Environmental Tobacco Smoke (ETS) Control	Y
IEQc1	Outdoor Air Delivery Monitoring	0 / 1
IEQc2	Increased Ventilation	0 / 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	0 / 1
IEQc4.4	Low-Emitting Materials-Composite Wood and Agrifiber Products	0 / 1
IEQc5	Indoor Chemical and Pollutant Source Control	0 / 1
IEQc6.1	Controllability of Systems-Lighting	0 / 1
IEQc6.2	Controllability of Systems-Thermal Comfort	1 / 1
IEQc7.1	Thermal Comfort-Design	0 / 1
IEQc7.2	Thermal Comfort-Verification	0 / 1
IEQc8.1	Daylight and Views-Daylight	0 / 1
IEQc8.2	Daylight and Views-Views	1 / 1

INNOVATION IN DESIGN		5 OF 6
IDc1.1	Innovation in Design	0 / 1
IDc1.1	Innovation in Design: Occupant Engagement	1 / 1
IDc1.2	Innovation in Design	0 / 1
IDc1.2	IDc1.2: Reduced Mercury Lighting	1 / 1
IDc1.3	Exemplary Performance - Maximize Open Space	1 / 1
IDc1.3	Innovation in Design	0 / 1
IDc1.4	Exemplary Performance - Public Transportation Access	1 / 1
IDc1.4	Innovation in Design	0 / 1
IDc1.5	Innovation in Design	0 / 1
IDc1.5	Innovation in Design	0 / 1
IDc2	LEED® Accredited Professional	1 / 1

REGIONAL PRIORITY CREDITS		3 OF 3
SSc3	Brownfield Redevelopment	1 / 1
SSc6.1	Stormwater Design-Quantity Control	1 / 1
MRc1.1	Building Reuse-Maintain Existing Walls, Floors and Roof	1 / 1

TOTAL 62 OF 109

MORE INFORMATION

- Harvard Faculty of Arts and Sciences: http://www.fas.harvard.edu/home/
- Leverett House - leveret.harvard.edu
- Harvard - Green Building Resource: http://www.energyandfacilities.harvard.edu/green-building-resource
- Harvard - Green Building Services: http://www.energyandfacilities.harvard.edu/project-technical-support/capital-projects/sustainable-design-support-services