HARVARD | BUSINESS | SCHOOL

GREEN is the new Crimson

HBS Tata Hall Executive Education Center
Harvard Way, Boston, MA 02163
Project Profile

LEED-NC v3
LEED Platinum
2014

The Tata Hall Executive Education Center serves as a model for high performance building design on the Harvard Business School (HBS) campus. The project's design is centered on creating a healthy and sustainable learning, living and working environment that is focused on human comfort, energy and water conservation, and environmental stewardship.

The 7-story, 153,700 square foot multi-use building, located to the west of the Charles River, provides living and learning spaces for the HBS Executive Education Program. Tata Hall houses 22 living groups with 180 bedrooms and associated living group lounges, two 99-person case method classrooms, seminar spaces, project rooms, reception lounges, and administrative offices.

The project team applied an integrated approach to sustainable design, which incorporated environmental strategies that influenced all aspects of the building's design. The site and landscape were designed to integrate strategies to reduce stormwater runoff and create a comfortable outdoor environment. The building envelope was designed to meet a high performance target for occupant comfort while reducing total energy use of the building. The daylighting design creates well-lit workspaces for students, faculty and staff offering solar control during critical periods of the day to reduce cooling loads and create a high quality visual environment. The high efficiency HVAC system provides comfort, high indoor air quality, user controls, and energy conservation, while the plumbing design strategy conserves potable water use. The project design achieved LEED Platinum certification.

LEED® Facts

Harvard Business School
Tata Hall Executive Education Center

Location	Boston, MA
Rating System	LEED-NC v3
Certification	Platinum
Total Points	82/110
Sustainable Sites	22/26
Water Efficiency	6/10
Energy and Atmosphere	28/35
Materials and Resources	6/14
Indoor Environmental Quality	11/15
Innovation and Design	6/6
Regional Priority	3/4

Project Metrics

48% water savings compared to an Energy Policy Act of 1992 baseline

43% reduction in energy costs compared to the baseline standard (ASHRAE 90.1-2007), estimated via energy modeling

5.2% of energy use (by cost) is provided by an on-site renewable energy system (PV)

92% of regularly occupied areas have access to views

90% of individual spaces, including bedrooms, have individual lighting controls

90% of individual spaces, including bedrooms, have individual thermal comfort controls

PROJECT OVERVIEW

Photo Copyright William Rawn Associates, Architects, Inc., 2014

Photo Copyright William Rawn Associates, Architects, Inc., 2014

Photo Copyright William Rawn Associates, Architects, Inc., 2014

Photo Copyright William Rawn Associates, Architects, Inc., 2014

PROJECT TEAM

Owner	Harvard Business School
Project Manager	Harvard Business School
Architect	William Rawn Associates, Architects, Inc.
MEP Engineer	AKF Group LLC
Contractor	BOND
Commissioning Authority	Aramark
Sustainability Consultant	Atelier Ten, Green Building Services

ENERGY EFFICIENCY AND INDOOR ENVIRONMENTAL QUALITY

MECHANICAL AND ELECTRICAL SYSTEMS

ECM 1: Displacement Ventilation (Classrooms)

ECM 2: High Efficiency Fan Coil Units (Living Groups)

ECM 3: Enthalpy Recovery System

ECM 4: High Efficiency Fans and Motors

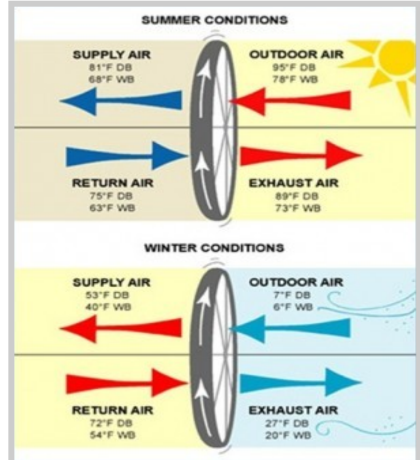
ECM 5: Energy Efficient Lighting

ECM 6: Occupancy Sensors

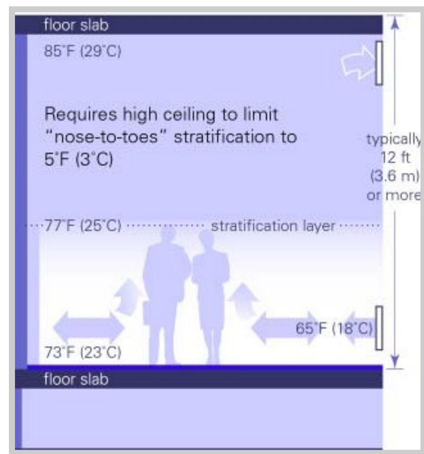
ECM 7: High Efficiency Condensing Boilers

The overall strategy of the HVAC system design was to reduce energy use through the installation of high efficiency equipment and controls. The fans are controlled by variable frequency drives and have variable air volume boxes downstream of the supply fans in order to provide ventilation. Occupancy sensors tied to the variable air volume (VAV) boxes were installed in the bedroom and living areas to control the ventilation air and reduce HVAC system energy when these spaces are unoccupied. CO_2 sensors were also installed in densely occupied spaces in order to reduce energy consumption. The HVAC system also includes an enthalpy recovery system that recovers energy from the exhaust air to precondition ventilation air (for dedicated outdoor air units). Additionally, high efficiency condensing boilers were installed for space heating as well as for the domestic hot water. All water-side systems in the building have variable flow pumping.

All lighting in the building is energy efficient fluorescent or LED type. Lighting controls were installed throughout the building including vacancy sensors for living areas and specific controls for classrooms, and the pavilion to help reduce the lighting energy load. A daylight harvesting system was also used to automatically turn off or dim lighting in areas when the amount of illumination provided by daylight is sufficient. New electrical metering of distribution panels serving lighting, HVAC, and receptacle loads was also installed.



Typical Energy Exchange Through an Enthalpy Wheel: Copyright DAC Sales (http://www.dac-hvac.com/energy-recovery/energy-recovery-wheels-what-is-an-enthalpy-wheel/), 2012



Displacement Ventilation Diagram: Copyright AKF Group LLC, 2011

Photo Copyright William Rawn Associates, Architects, Inc., 2014

INDOOR ENVIRONMENTAL QUALITY

The high indoor environmental quality of the Tata Hall building was a significant focus of the project. The selection of low chemical-emitting building and finish materials, as well as appropriate construction measures to prevent mold and mildew growth within the building ensure a high level of indoor air quality, and thus occupant health, throughout the project. All chemical use spaces have auto closing doors as well as compliant exhaust systems. To reduce contaminants brought in from the outdoors, all main entryways have grills or floor mats.

Other strategies to increase the indoor environmental quality addressed the lighting and thermal comfort of the space. These included:

- High efficiency lighting with appropriate light levels
- Filtered outdoor air for ventilation
- Occupancy sensors and controls
- Daylight access and views
- High performance double skin facade (control glare and solar heat gain)

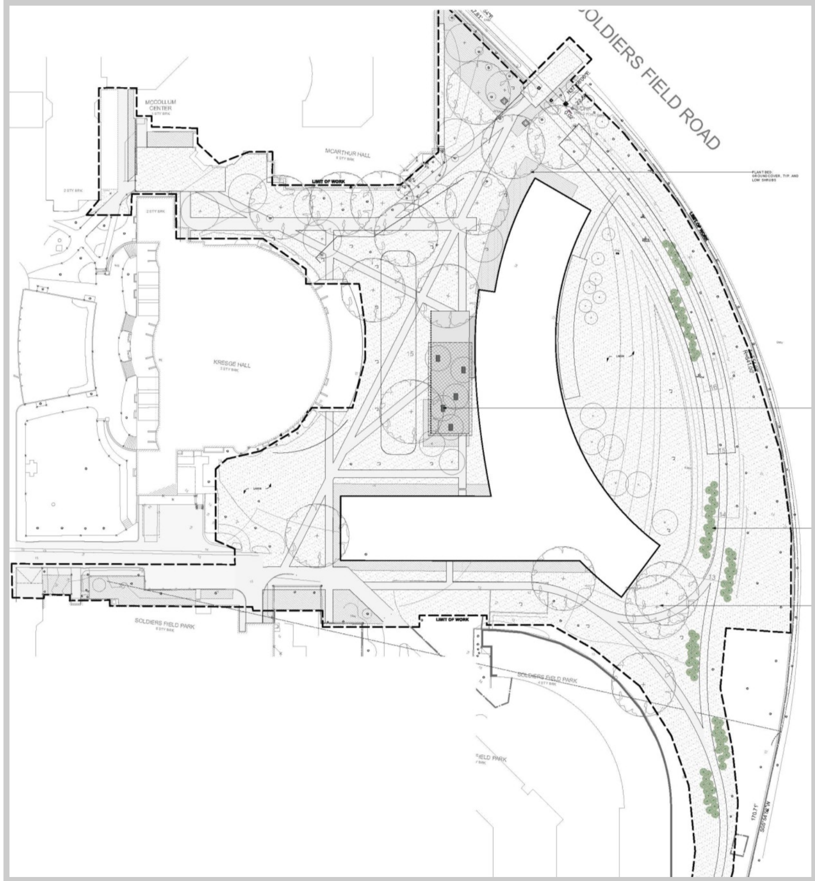
LANDSCAPE AND SITE

The Tata Hall landscape and site are designed to be integrated into the Harvard Business School campus and surrounding community. The design features a large open lawn facing the Charles River to the west and more intimate outdoor gathering spaces on the east. The design is centered on reducing and filtering stormwater runoff, mitigating the urban heat island effect, and creating a comfortable outdoor environment around Tata Hall.

The proximity to the Charles River makes stormwater management a priority for the project. The site was designed to filter sediments and phosphorous. Infiltration basins on the site then slowly release stormwater during off peak hours. This system will help reduce peak stormwater run-off rates to ease the burden on the local infrastructure.

The project's site design strategy to have limited hardscape and a vast vegetated area on the ground contributes to reducing the urban heat island effect. The design also included a high albedo roof membrane, pavers with high SRI values, and increased shading of the hardscape areas.

For most of the landscaped areas, native plant species were used in order to help reduce the need for non-natural fertilizers and pesticides as well as decrease the need for irrigation.



Site Plan: Copyright Reed Hilderbrand Associates, Inc., 2012

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 that are designed to use less water than typical fixtures and systems are widely available and when combined with conscientious occupant use patterns and controls, can result in a large reduction in water use.

Some of the water conservation strategies incorporated in the project include:

- Low-flow plumbing fixtures (urinals: 0.125 GPF; toilets: 1.28 GPF and 1.13 GPF; showers: 1.5 GPM; lavatory faucets: 0.5 GPM)
- Water efficient appliances
- Water efficient irrigation system
- Reduced HVAC water use

These strategies led to a 48% reduction in water use, compared to the EPAct 1992 baseline.

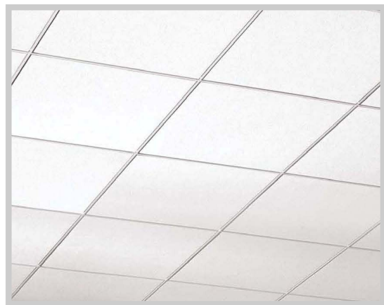
PRODUCTS AND MATERIALS

Materials for the Tata Hall project were selected for their high recycled content, and whenever possible, local extraction and manufacture. Additionally, the majority of building woodwork is Forest Stewardship Council (FSC) certified wood, which comes from sustainably managed forests. Recycled materials can either be post-consumer (material that has been through the public recycling process) or pre-consumer (material that is a by-product of manufacturing). Local materials can be environmentally preferable because they reduce transportation energy and support local economies. The material selection process was also driven by the goal of creating a healthy working environment that will improve occupant productivity and well-being. The design of the building interior can significantly contribute to this project goal.

The use of green building materials and along with high quality construction methods can help achieve not only LEED points but also support the local community. Making sustainable choices about the materials that will go into Tata Hall will allow the project to have a positive impact on both building occupants and the building industry.

Roxul Acoustical Fire Batt Insulation

- 75% pre-consumer recycled content
- Manufactured 454 miles from site



Armstrong OPTIMA Open Plan

- 12% post -consumer recycled content
- 59% pre-consumer recycled content

LATICRETE 9235 Membrane

- Low-VOC: 2.4 g/L
- GREENGUARD Certified

Bull Moose Tube HSS Tubing

- 57% post -consumer recycled content
- 38% pre-consumer recycled content
- Manufactured 488 miles from site
- Materials extracted 282 miles from site

KEY HIGHLIGHTS

31%	recycled materials (post-consumer content plus one-half of pre-consumer content) value as a percentage of total materials value
16%	regional materials (manufactured within 500 miles) value as a percentage of total materials value
55%	Forest Stewardship Council (FSC) certified wood—value as a percentage of new wood materials cost
100%	low-VOC, or no-VOC adhesives and sealants, were used
88%	of construction waste diverted from landfill via recycling and reuse

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.

Please print this project profile only if necessary.
If printing is required, please print double sided and recycle when finished. Thank you!

PROJECT SCORECARD

LEED FOR NEW CONSTRUCTION & MAJOR RENOVATIONS (V2009)

ATTEMPTED: 75, DENIED: 0, PENDING: 0, AWARDED: 82 OF 110 POINTS

SUSTAINABLE SITES	22 OF 26
SSp1 Construction Activity Pollution Prevention	Y
SSc1 Site Selection	1 / 1
SSc2 Development Density and Community Connectivity	5 / 5
SSc3 Brownfield Redevelopment	0 / 1
SSc4.1Alternative Transportation-Public Transportation Access	6 / 6
SSc4.2Alternative Transportation-Bicycle Storage and Changing Rooms	1 / 1
SSc4.3Alternative Transportation-Low-Emitting and Fuel-Efficient Vehicles	3 / 3
SSc4.4Alternative Transportation-Parking Capacity	2 / 2
SSc5.1Site Development-Protect or Restore Habitat	0 / 1
SSc5.2Site Development-Maximize Open Space	1 / 1
SSc6.1Stormwater Design-Quantity Control	1 / 1
SSc6.2Stormwater Design-Quality Control	1 / 1
SSc7.1Heat Island Effect, Non-Roof	0 / 1
SSc7.2Heat Island Effect-Roof	1 / 1
SSc8 Light Pollution Reduction	0 / 1

WATER EFFICIENCY	6 OF 10
WEp1 Water Use Reduction-20% Reduction	Y
WEc1 Water Efficient Landscaping	2 / 4
WEc2 Innovative Wastewater Technologies	0 / 2
WEc3 Water Use Reduction	4 / 4

ENERGY AND ATMOSPHERE	28 OF 35
EAp1 Fundamental Commissioning of the Building Energy Systems	Y
EAp2 Minimum Energy Performance	1 / 0
EAp3 Fundamental Refrigerant Mgmt	1 / 0
EAc1 Optimize Energy Performance	16 / 19
EAc2 On-Site Renewable Energy	3 / 7
EAc3 Enhanced Commissioning	2 / 2
EAc4 Enhanced Refrigerant Mgmt	2 / 2
EAc5 Measurement and Verification	3 / 3
EAc6 Green Power	2 / 2

MATERIALS AND RESOURCES	6 OF 14
MRp1 Storage and Collection of Recyclables	Y
MRc1.1Building Reuse-Maintain Existing Walls, Floors and Roof	0 / 3
MRc1.2Building 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	11 OF 15
IEQp1 Minimum IAQ Performance	Y
IEQp2 Environmental Tobacco Smoke (ETS) Control	1 / 0
IEQc1 Outdoor Air Delivery Monitoring	1 / 1
IEQc2 Increased Ventilation	1 / 1
IEQc3.1Construction IAQ Mgmt Plan-During Construction	1 / 1
IEQc3.2Construction IAQ Mgmt Plan-Before Occupancy	1 / 1
IEQc4.1Low-Emitting Materials-Adhesives and Sealants	1 / 1
IEQc4.2Low-Emitting Materials-Paints and Coatings	0 / 1
IEQc4.3Low-Emitting Materials-Flooring Systems	0 / 1
IEQc4.4Low-Emitting Materials-Composite Wood and Agrifiber Products	0 / 1
IEQc5 Indoor Chemical and Pollutant Source Control	1 / 1
IEQc6.1Controllability of Systems-Lighting	1 / 1
IEQc6.2Controllability of Systems-Thermal Comfort	1 / 1
IEQc7.1Thermal Comfort-Design	1 / 1
IEQc7.2Thermal Comfort-Verification	1 / 1
IEQc8.1Daylight and Views-Daylight	0 / 1
IEQc8.2Daylight and Views-Views	1 / 1

INNOVATION IN DESIGN	6 OF 6
IDc1.1 Innovation in Design	1 / 1
IDc1.1 Innovation in Design	0 / 1
IDc1.2 Innovation in Design	1 / 1
IDc1.2 Innovation in Design	0 / 1
IDc1.3 Innovation in Design	1 / 1
IDc1.3 Innovation in Design	0 / 1
IDc1.4 Innovation in Design	0 / 1
IDc1.4 Innovation in Design	1 / 1
IDc1.5 Innovation in Design	0 / 1
IDc1.5 Innovation in Design	1 / 1
IDc2 LEED® Accredited Professional	1 / 1

REGIONAL PRIORITY CREDITS	3 OF 4
SSc3 Brownfield Redevelopment	0 / 1
SSc6.1 Stormwater Design-Quantity Control	1 / 1
SSc7.1 Heat Island Effect, Non-Roof	0 / 1
SSc7.2 Heat Island Effect-Roof	1 / 1
EAc2 On-Site Renewable Energy	1 / 1
MRc1.1Building Reuse-Maintain Existing Walls, Floors and Roof	0 / 1

TOTAL	82 OF 110

PROJECT HIGHLIGHT: GREEN ROOF

One of Tata Hall's key sustainability features is its green roof. The green roof is comprised of drought tolerant plants, which require little to no irrigation water. Green roofs benefit the built environment by reducing and filtering stormwater runoff, reducing the building's heat island effect through evapotranspiration, and providing additional insulation to the roofing structure. During hot summer days, the surface temperature of a green roof can be cooler than the air temperature, whereas the surface temperature of a conventional rooftop can be up to 90°F warmer (http://www.epa.gov/heatisland/mitigation/greenroofs.htm). Tata Hall will be the first building on the HBS Campus to have a green roof.

MORE INFORMATION

- Harvard Business School: http://www.hbs.edu/Pages/default.aspx
- HBS Sustainability: http://www.hbs.edu/about/campus-and-culture/Pages/commitment-to-sustainability.aspx
- Harvard - Green Building Resource: http://green.harvard.edu/theresource
- Harvard - Green Building Services: http://green.harvard.edu/green-building-services
- Follow Green Building Services: http://www.facebook.com/HarvardGBS or @Harvard_GBS

Please print this project profile only if necessary.
If printing is required, please print double sided and recycle when finished. Thank you!

HARVARD RECYCLES