

The Arnold Arboretum, owned by Harvard University since 1922, has developed a Research and Administration Building on what is known as “Weld Hill” in Boston, MA. The project is the new construction of a 45,000 square foot, two-story building on a small portion of a 14.2 acre parcel. The building includes office space, research/laboratory rooms, lab support rooms, plant growth chambers, conference rooms, and twelve greenhouses. The state-of-the-art greenhouse and laboratory facility is intended to strengthen Harvard and the Arboretum’s botanical research capabilities. The building houses 48 researchers and assistants, in addition to staff in administrative offices.



The parcel is bounded by Weld Street, Walter Street, and Centre Street in the Jamaica Plain neighborhood – access to and egress from the site is via Centre Street. The project team worked to minimize the impact of the project on the land and the surrounding neighborhood both during construction and at occupancy. After construction, the site was restored to its original landscape of meadow and trees for neighbors to use and enjoy.

Overarching goals and priorities for the project included creating a healthy and productive workspace that minimizes environmental impacts and maximizes energy-efficiency. Weld Hill achieved LEED-NC v2.1 Gold certification.

Weld Hill Research Building
Photo: Jay Connor, Arnold Arboretum

PROJECT HIGHLIGHTS

LEED® Facts
Arnold Arboretum—Weld Hill
Harvard University
2011



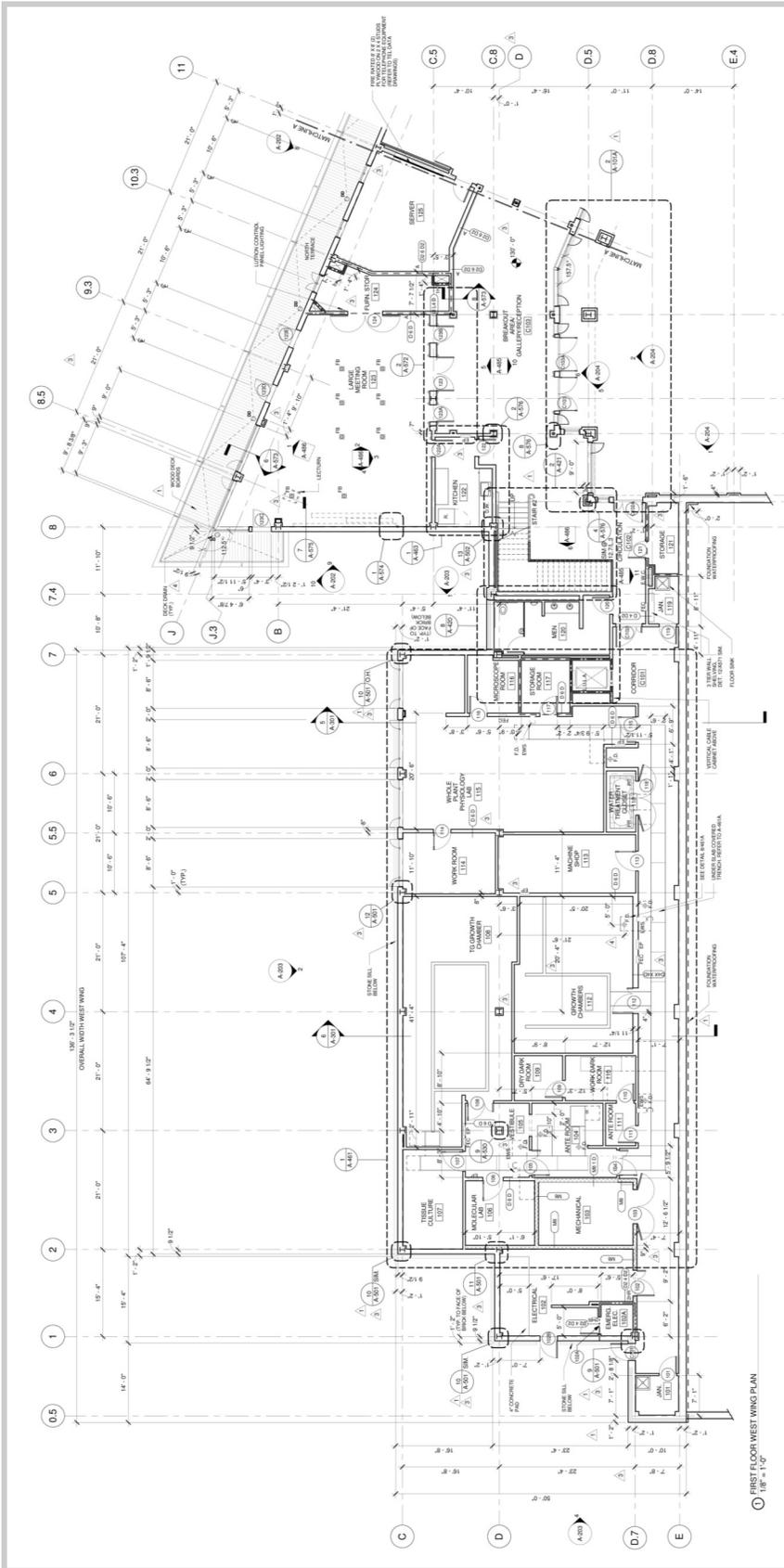
Location.....	1300 Centre St Boston, MA 02131
Rating System.....	LEED-NC v2.1
Certification Achieved.....	Gold
Total Points Achieved.....	43/69
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Sustainable Sites.....	9/14
Water Efficiency.....	4/5
Energy and Atmosphere.....	6/17
Materials and Resources.....	6/13
Indoor Environmental Quality.....	13/15
Innovation and Design.....	5/5

30%	reduction in annual energy cost compared to a ASHRAE 90.1-1999 baseline
42%	reduction of water use compared to an EPAct 1992 baseline
95%	of the total percentage of construction waste was diverted from landfills
100%	reduction in potable water use for irrigation



PROJECT OVERVIEW

WELD HILL RESEARCH BUILDING - WEST FLOOR PLAN



PROJECT TEAM

Owner	Harvard University
Architect	Kling Stubbins
Contractor	Lee Kennedy Co., Inc.
MEP Engineer	Cosentini Engineers
Commissioning Authority	Facility Dynamics Engineering
Sustainability Consultant	The Green Engineer
Peer Review	Harvard Green Building Services

ADDITIONAL RESOURCES

Arnold Arboretum
<http://arboretum.harvard.edu/>

Weld Hill Research Facility
<http://arboretum.harvard.edu/research/weld-hill/>

Weld Hill LEED Certification Announcement
<http://arboretum.harvard.edu/green-building-certification/>

Harvard Green Building Services
<http://green.harvard.edu/green-building-services>

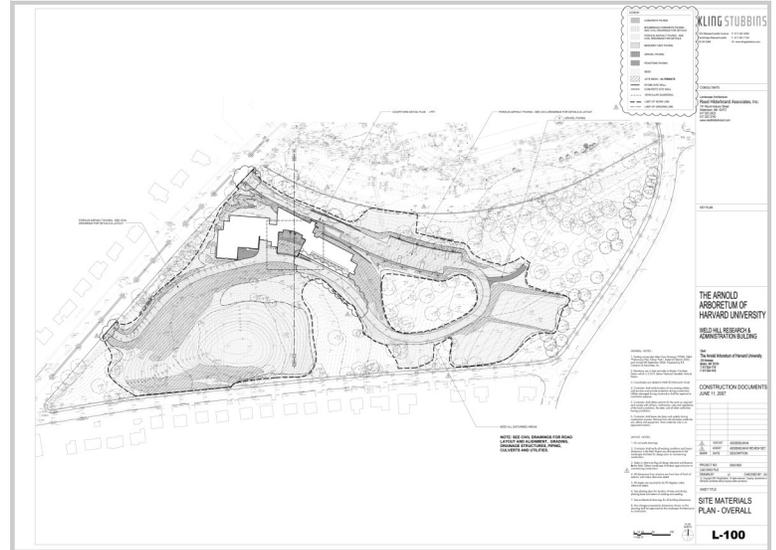
Harvard Green Building Resource
<http://green.harvard.edu/theresource>

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LANDSCAPE AND VEGETATION

The Weld Hill Research and Administration Building at the Arnold Arboretum achieved LEED credits WE 1.1 & 1.2 because it does not require using potable water for irrigation, and no permanent irrigation system was installed on the site. The planting design replaces the pre-existing drought tolerant meadow after disturbance. In contrast to lawn, vegetation such as native shrubs, canopy trees, and understory trees, do not require irrigation during typical rainfall. These efforts resulted in a 100 % reduction in overall potable water use.



Weld Hill Site Plan
Photo: Kling Stubbins

Weld Hill Research Building

Photo: Jay Connor, Arnold Arboretum

DROUGHT TOLERANT NATIVE SHRUBS:

- CLETHRA (*CLETHRA ALNIFOLIA*)
- WINTERBERRY (*IIIEX VERTICILLATA*)
- BAYBERRY (*MYRICA PENNSYLVANICA*)
- JETBEAD (*RHODOYPOS SCANDENS*)



DROUGHT TOLERANT NATIVE CANOPY TREES:

- RED MAPLE (*ACER RUBRUM*)
- SUGAR MAPLE (*ACER SUCCHARUM*)
- COFFEETREE (*GYMNOCLADUS DIOCUS*)
- RED OAK (*QUERCUS RUBRA*)



DROUGHT TOLERANT UNDERSTORY TREES:

- SHADBLOW (*AMELANCHIER ARBOREA*)
- REDBUD (*CERCIS CANADENSIS*)
- WITCHHAZEL (*HAMANELIS VERNALIS*)
- CRABAPPLES (*MALUS SP.*)



Photo Credit: Google Images

ENERGY EFFICIENCY

Harvard University has committed to reduce greenhouse gas emissions 30% below 2006 levels by 2016, inclusive of growth. Therefore energy efficiency was a main goal of this renovation project.

MECHANICAL SYSTEMS

ECM 1: GSHP—Ground Source Heat Pump

Eighty-eight ground-source wells were drilled on the project site. This closed-loop system provides an efficient heat sink for the heat pumps to heat and cool the building, effectively using the energy in the ground to help condition the building.

ECM 2: Lab Ventilation

The project team worked with Harvard Environmental Health and Safety Group to reduce ventilation rates below the standard 10 air changes per hour (ACH) to 6 ACH during occupied times and 2 ACH during unoccupied times

ECM 3: Lab Shut Downs

The lab spaces are designed so that individual sections of the lab can be fully shut down when that section has been vacated and is awaiting a new user group

ECM 4: Commissioning

The mechanical and electrical systems have been 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.

ECM 5: Renewable Energy

Renewable Energy Certificates (RECs) have been purchased from Sterling Planet (wind power) equivalent to 100% of the estimated electricity consumption over two years.

ELECTRICAL SYSTEMS

ECM 1: Plug Loads

Energy Star equipment was selected for all equipment in the building, which includes refrigerators, computers and printers.

ECM 2: Lighting Controls

Each space has overhead lighting controlled by multiple switches/zones and each desk has either under-counter task lights or desk lamps for multiple lighting levels based on different needs. The project's lighting design allows occupants to adjust the lighting to suit their individual preferences, which not only increases occupant productivity and comfort, but also decreases energy use.

ECM 3: Lighting Sensors

Thirty-three individual occupancy sensors have been installed, shutting off the lights and saving energy when nobody is in the room. Lights near perimeter windows are controlled by daylight sensors, dimming lights and saving energy when natural light is sufficient.

ECM 4: Light Fixtures

Energy-efficient and low-mercury fluorescent lighting fixtures and lamps were carefully chosen and strategically located within each space to reduce electricity consumption while maintaining adequate lighting levels for each type of space.

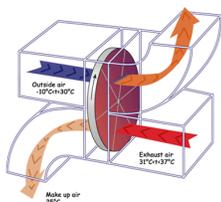
ENERGY EFFICIENCY



Sloan EHD-501 Bathroom Dryer ®



Task Lighting



Heat Recovery Wheel



Occupancy Sensor

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 may not be used in commercial or political materials, advertisements, emails, products, promotions that in any way suggests approval or endorsement of Harvard University.





WATER EFFICIENCY



Sloan ETF-80® Bathroom Faucet
.5 gpm flow rate

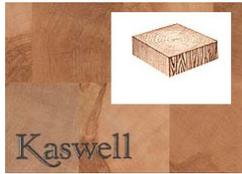


Symmons 1-117-FS® Shower Fixture
1.6 gpm flow rate



Sloan WES-1000® Bathroom Urinal
0 gpf flush rate

RECYCLED / REGIONAL MATERIALS



Kaswell Wood Flooring (Red Oak)®
100% salvaged wood
100% pre-consumer recycled content



Naturalite Skylight®
50% pre-consumer recycle content
25% post-consumer recycled content



Landscape Steel Edging®
100% pre-consumer recycled content

INDOOR ENVIRONMENTAL QUALITY - PAINTS AND ADHESIVES



Wood Pride - Clear Varnish
182 VOC content
350 VOC limit
Green Seal approved



Lifemaster - Primer
0 VOC content
50 VOC limit
Green Seal approved



BASF - Lapidolith
0 VOC content
420 VOC limit
Green Seal approved



Pecora - Urexpan NR200
0 VOC content
250 VOC limit
SCAQMD approved



LA-Co - Slic-Tite with Teflon
0 VOC content
250 VOC limit
SCAQMD approved



DOW - Insulating Sealant
0 VOC content
420 VOC limit
Green Seal approved

Photo Credit: All photos were taken from the manufacture's website

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LEED for New Construction

43	Points Achieved	Certified 26 to 32 points Silver 33 to 38 points Gold 39 to 51 points Platinum 52 or more points	Possible Points:	69
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9	Sustainable Sites	Possible Points:	14
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Y	Prereq 1	Erosion & Sedimentation Control	
1	Credit 1	Site Selection	1
	Credit 2	Urban Redevelopment	1
	Credit 3	Brownfield Redevelopment	1
1	Credit 4.1	Alternative Transportation, Public Transportation Access	1
1	Credit 4.2	Alternative Transportation, Bicycle Storage & Changing Rooms	1
1	Credit 4.3	Alternative Transportation, Alternative Fuel Vehicles	1
1	Credit 4.4	Alternative Transportation, Parking Capacity & Carpooling	1
	Credit 5.1	Reduced Site Disturbance, Protect or Restore Open Space	1
1	Credit 5.2	Reduced Site Disturbance, Development Footprint	1
1	Credit 6.1	Stormwater Management, Rate & Quantity	1
1	Credit 6.2	Stormwater Management, Treatment	1
	Credit 7.1	Heat Island Effect, Non-Roof	1
	Credit 7.2	Heat Island Effect, Roof	1
1	Credit 8	Light Pollution Reduction	1

4	Water Efficiency	Possible Points:	5
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1	Credit 1.1	Water Efficient Landscaping, 50% Reduction	1
1	Credit 1.2	Water Efficient Landscaping, No Potable Use or No Irrigation	1
	Credit 2	Innovative Wastewater Technologies	1
1	Credit 3.1	Water Use Reduction, 20% Reduction	1
1	Credit 3.2	Water Use Reduction, 30% Reduction	1

6	Energy & Atmosphere	Possible Points:	17
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Y	Prereq 1	Fundamental Building Systems Commissioning	
Y	Prereq 2	Minimum Energy Performance	
Y	Prereq 3	CFC Reduction in HVAC&R Equipment	
1	Credit 1.1	Optimize Energy Performance, 15% New / 5% Existing	1
1	Credit 1.2	Optimize Energy Performance, 20% New / 10% Existing	1
1	Credit 1.3	Optimize Energy Performance, 25% New / 15% Existing	1
	Credit 1.4	Optimize Energy Performance, 30% New / 20% Existing	1
	Credit 1.5	Optimize Energy Performance, 35% New / 25% Existing	1
	Credit 1.6	Optimize Energy Performance, 40% New / 30% Existing	1
	Credit 1.7	Optimize Energy Performance, 45% New / 35% Existing	1
	Credit 1.8	Optimize Energy Performance, 50% New / 40% Existing	1
	Credit 1.9	Optimize Energy Performance, 55% New / 45% Existing	1
	Credit 1.10	Optimize Energy Performance, 60% New / 50% Existing	1
	Credit 2.1	Renewable Energy, 5%	1
	Credit 2.2	Renewable Energy, 10%	1
	Credit 2.3	Renewable Energy, 20%	1
1	Credit 3	Additional Commissioning	1
1	Credit 4	Ozone Protection	1
	Credit 5	Measurement & Verification	1
1	Credit 6	Green Power	1

6	Materials & Resources	Possible Points:	13
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Y	Prereq 1	Storage & Collection of Recyclables	
	Credit 1.1	Building Reuse, Maintain 75% of Existing Walls, Floors, & Roof	1
	Credit 1.2	Building Reuse, Maintain 100% of Existing Walls, Floors, & Roof	1
	Credit 1.3	Building Reuse, Maintain 100% Shell & 50% Non-Shell	1
1	Credit 2.1	Construction Waste Management, Divert 50% from Landfill	1
1	Credit 2.2	Construction Waste Management, Divert 75% from Landfill	1
	Credit 3.1	Resource Reuse, Specify 5%	1
	Credit 3.2	Resource Reuse, Specify 10%	1
1	Credit 4.1	Recycled Content, 5% (Post-consumer + 1/2 post-industrial)	1
1	Credit 4.2	Recycled Content, 10% (Post-consumer + 1/2 post-industrial)	1
1	Credit 5.1	Local/Regional Materials, 20% Manufactured Locally	1
1	Credit 5.2	Local/Regional Materials, of 20% Above, 50% Harvested Locally	1
	Credit 6	Rapidly Renewable Materials	1
	Credit 7	Certified Wood	1

13	Indoor Environmental Quality	Possible Points:	15
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Y	Prereq 1	Minimum IAQ Performance	
Y	Prereq 2	Environmental Tobacco Smoke (ETS) Control	
1	Credit 1	Carbon Dioxide Monitoring	1
1	Credit 2	Ventilation Effectiveness	1
1	Credit 3.1	Construction IAQ Management Plan, During Construction	1
1	Credit 3.2	Construction IAQ Management Plan, Before Occupancy	1
1	Credit 4.1	Low-Emitting Materials, Adhesives & Sealants	1
1	Credit 4.2	Low-Emitting Materials, Paints and Coatings	1
	Credit 4.3	Low-Emitting Materials, Carpet	1
1	Credit 4.4	Low-Emitting Materials, Composite Wood & Agrifiber Products	1
1	Credit 5	Indoor Chemical & Pollutant Source Control	1
1	Credit 6.1	Controllability of Systems, Perimeter	1
	Credit 6.2	Controllability of Systems, Non-Perimeter	1
1	Credit 7.1	Thermal Comfort, Comply with ASHRAE 55-1992	1
1	Credit 7.2	Thermal Comfort, Permanent Monitoring System	1
1	Credit 8.1	Daylight & Views, Daylight 75% of Spaces	1
1	Credit 8.2	Daylight & Views, Views for 90% of Spaces	1

5	Innovation & Design Process	Possible Points:	5
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1	Credit 1.1	Innovation in Design	1
1	Credit 1.2	Innovation in Design	1
1	Credit 1.3	Innovation in Design	1
1	Credit 1.4	Innovation in Design	1
1	Credit 2	LEED® Accredited Professional	1