

Should We Stop Trying to Update to the Latest Model Building Energy Code?



Photo Credit: Sam Oberter

Pioneering Net Zero / Positive Practices

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NESEA Building Energy
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E+ Green Buildings

Mayoral Call for Leadership

- Demonstration Program
- Green Community Forum

Launch March 2011



LEADERSHIP

Mayor Menino's E+ Green Building Program has challenged leading architects, builders, and developers to work together to construct high performance, green, urban homes and to demonstrate the feasibility of regenerative buildings in Boston. Five key objectives guide the program and selection process:



FEASIBILITY

Demonstrates the performance, construction, and financial potential for locally built, energy positive, deep green, urban buildings with on-site renewable energy resources.



FUTURE PROTOTYPES

Construct high performance, green buildings using "on-the-shelf" products and materials, and replicable strategies that can serve as models for future practice.



HOUSING OPPORTUNITIES

Provide new housing opportunities affordable to a range of income earners in sustainable neighborhoods that are connected to nearby transit, work, and amenities.



AWARENESS

Raise public and professional awareness of the importance and potential for high performance, residential, green buildings and design and construction practices.



URBAN DESIGN

Reinvigorate Boston neighborhoods with new development that is both expressive of its high performance, green building features and is respectful of its context.

"E+ Green Buildings produce more energy than they use on an annual basis, giving energy back to the grid and saving homeowners money."

*- Thomas M. Menino, Mayor
City of Boston*

E+ Green Buildings

Net Energy Positive

- *Highly Efficient Envelops*
 - *Simple / Small Systems*
- = HERS 30 to 40**
- *Solar PV to Net Positive*



www.resnet.us

ENERGY POSITIVE

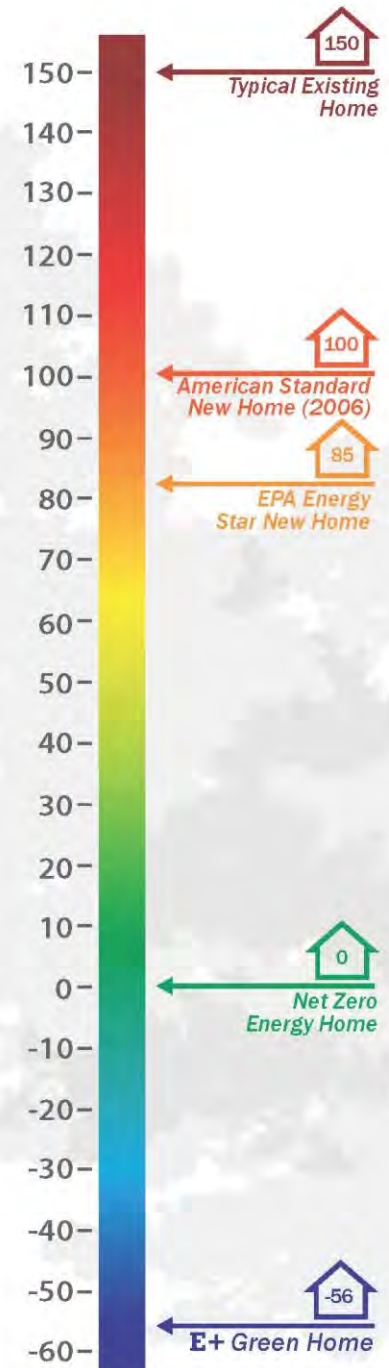
Home Energy Rating System (HERS)

The E+ Green Building program requires buildings that generate more energy than they use annually as indicated by a HERS Index of less than zero.

Developed by Residential Energy Services Network, the HERS models building energy performance. A comparable home, the HERS Reference Home, which is built to the specifications of the 2006 International Energy Conservation Code, scores a HERS Index of 100. A Net Zero Energy home scores a HERS Index of 0 and an E+ Green Home scores a negative HERS Index.

Each 1-point decrease in the HERS Index corresponds to a 1% reduction in energy consumption compared to the HERS Reference Home. An Energy Star home must have a HERS Index of 85, or lower, and is 15% more energy efficient than the HERS Reference Home.

The HERS Index system has been developed by Residential Energy Services Network (RESNET). Text courtesy of RESNET. www.resnet.us



E+ Green Buildings

Deep Green

- **Site & Location**
- **Resource Efficient & Sensitive**
- **Human Health & Wellbeing**
- **Community & City**
- **Beautiful & Replicable**

E+

www.usgbc.org



BEYOND PLATINUM

Green Building Leadership in Energy & Environmental Design (LEED)

The E+ Green Building Program requires buildings that are environmentally positive and exceeding LEED for Homes Platinum, the highest certification level.

LEED® is the US Green Building Council's internationally-recognized green building certification system that provides building owners and operators with a framework for identifying and implementing practical and measurable green building design, construction, operations, and maintenance solutions. LEED for Homes scales credit requirements to the size of the building and both measures and verifies practice in eight key sustainability and environmental impact categories:



Sustainable Sites

Discourages building on previously undeveloped land, seeks to minimize a building's impact on ecosystems; encourages regionally appropriate landscaping, rewards smart transportation choices, and promotes reduction of stormwater runoff, erosion, heat island effect and construction-related pollution.



Indoor Environmental Quality

Promotes strategies that improve indoor air quality as well as those that provide occupant access to natural daylight and views and improve acoustics.



Water Efficiency

Encourages smarter use of water, inside and out. Water reduction is typically achieved through more efficient appliances, fixtures and fittings inside, and water-conscious landscaping outside.



Locations & Linkages

Encourages building on previously developed and infill sites and away from environmentally sensitive areas. Rewards homes that are built near existing infrastructure, community resources, and transit and in locations with access to open space for walking, physical activity and time outdoors.



Energy & Atmosphere

Encourages commissioning, energy use monitoring, efficient design and construction, efficient appliances, systems, and lighting, the use of renewable and clean sources of energy, generated on-site or off-site, and other innovative measures.



Awareness & Education

Encourages home builders and real estate professionals to provide homeowners, tenants and building managers with the education and tools they need to understand what makes their home green and how to make the most of those features.



Materials & Resources

Encourages the selection of sustainably grown, harvested, produced, and transported products and materials. Promotes waste reduction as well as reuse and recycling, and especially rewards the reduction of waste at a product's source.



Innovation in Design

Rewards the use of innovative technologies and strategies to improve a building's performance well beyond what is required by other LEED credits, or to reward green building considerations that are not specifically addressed elsewhere in the LEED rating system.

The LEED® Rating systems has been created by the US Green Building Council. Symbols and text courtesy of the USGBC. For more information on LEED, please visit: www.usgbc.org

E+ Green Buildings



RFP for Three City Sites

- *Efficient Location*
- *Urban Infill*
- *Previously Developed Land*
- *Walk to Public Transit*
- *Walk to Neighborhood Assets*

LOCATION

Building new homes in compact neighborhoods that are connected to nearby transit service and local amenities reduces transportation-related energy use, pollution, and saves homeowners money. Redeveloping vacant parcels saves land, reduces sprawl, revitalizes existing neighborhoods, and promotes sustainable communities.

156 HIGHLAND STREET



64 CATHERINE STREET



61 MARCELLA STREET



“Often, when your goal is driving real change in the marketplace, it’s best to show – not just tell...E+ is another example of Boston’s leadership under Mayor Menino.”

- Rick Fedrizzi, President, CEO, and Founding Chair of the U.S. Green Building Council



Winner

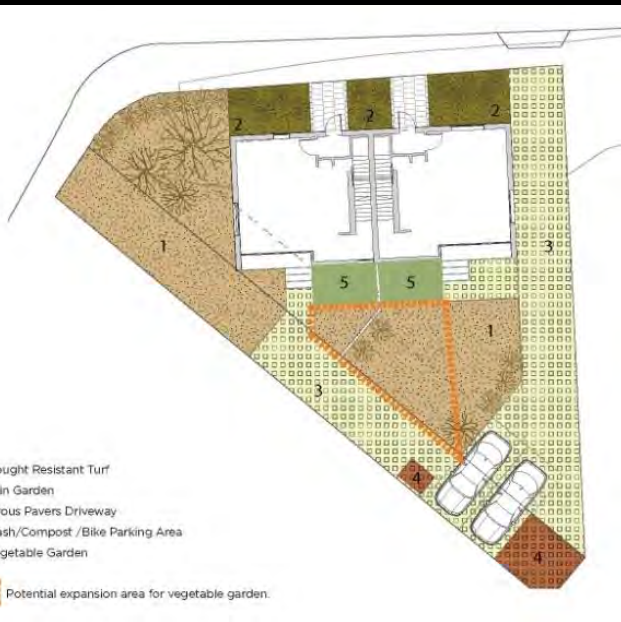
156 Highland Street Highland Park





Winner

64 Catherine Street Wood Bourne, JP

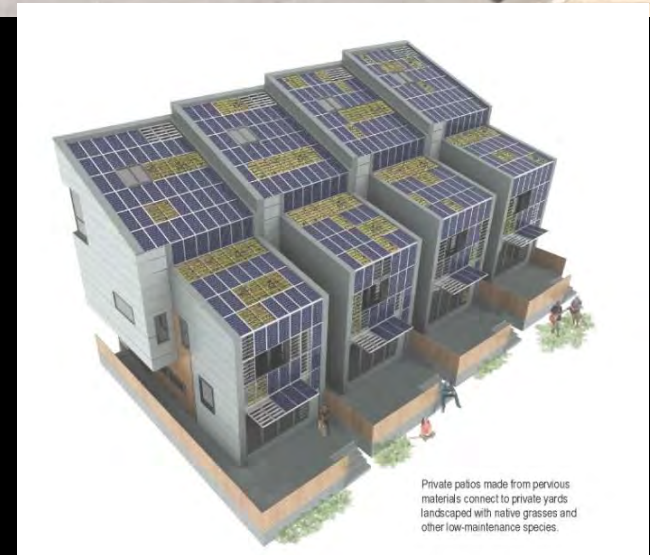


GFC Development Utile Inc.



Winner

61 Marcella Avenue Highland Park



Urbanica
ISA / Interface Studio Architects

E+ Green Buildings



Marcella St, Roxbury
Completed Fall 2013

Photo Credit: Sam Oberter



E+ Green Buildings

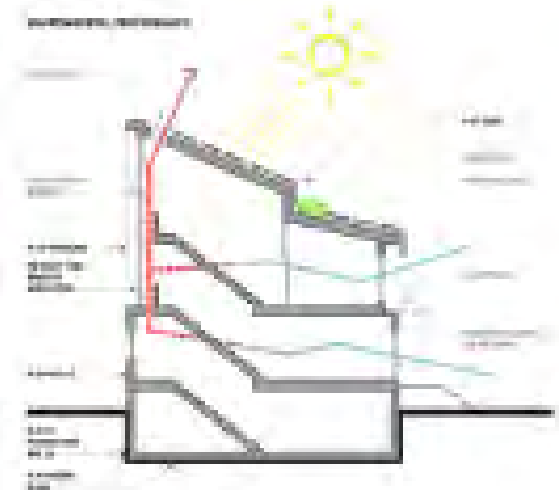


Passive Performance

ENVELOPE_

SUPER TIGHT, SUPER INSULATED

Figure 1: The URBANICA project is a high-performance building envelope system. The building envelope system is designed to provide a high level of thermal performance and airtightness. The system is composed of a series of layers, including a structural frame, insulation, and airtight membrane. The system is designed to provide a high level of thermal performance and airtightness. The system is composed of a series of layers, including a structural frame, insulation, and airtight membrane.



E+ Green Buildings



User Engagement





MARCELLA STREET

LEED FOR HOMES - FINAL **100.5/136**

 Innovation & Design Process (ID) **8/11**


 Location and Linkages (LL) **10/10**




 Sustainable Sites (SS) **16.5/22**


 Water Efficiency (WE) **5/15**


 Materials and Resources (MR) **11/16**


 Awareness and Education (AE) **1/3**


 Indoor Air Quality (EQ) **14/21**


 Energy and Atmosphere (EA) **35/38**




Building & System Use: 30.5 MMBtu
Solar PV Production: 37.5
Net Energy Positive: - 7.1 MMBTU

Home Energy Rating Certificate

230 Highland Street
Boston, MA

5 Stars Plus Confirmed

Energy Efficient

Uniform Energy Rating System						Energy Efficient			
1 Star	1 Star Plus	2 Stars	2 Stars Plus	3 Stars	3 Stars Plus	4 Stars	4 Stars Plus	5 Stars	5 Stars Plus
500-401	400-301	300-251	250-201	200-151	150-101	100-91	90-86	85-71	70 or Less

HERS Index: -9

General Information

Conditioned Area:	1955 sq. ft.	House Type:	Townhouse, inside unit
Conditioned Volume:	21728 cubic ft.	Foundation:	Enclosed crawl space
Bedrooms:	3		

Mechanical Systems Features

Air-source heat pump:	Electric, Htg: 10.0 HSPF, Cig: 26.0 SEER.
Air-source heat pump:	Electric, Htg: 8.9 HSPF, Cig: 18.0 SEER.
Water Heating:	Conventional, Electric, 0.98 EF, 80.0 Gal.
Duct Leakage to Outside:	NA
Ventilation System:	Balanced: HRV, 65 cfm, 20.0 watts.
Programmable Thermostat:	Heating: Yes Cooling: Yes

Building Shell Features

Ceiling Flat:	R-62	Slab:	None
Sealed Attic:	NA	Exposed Floor:	R-64
Vaulted Ceiling:	R-69	Window Type:	Schuco .139/34
Above Grade Walls:	R-41, R-19	Infiltration Rate:	Htg: 0.57 Cig: 0.57 ACH50
Foundation Walls:	R-0.0	Method:	Blower door test

Lights and Appliance Features

Percent Interior Lighting:	100.00	Range/Oven Fuel:	Electric
Percent Exterior Lighting:	100.00	Clothes Dryer Fuel:	Electric
Refrigerator (kWh/yr):	392.00	Clothes Dryer EF:	3.01
Dishwasher Energy Factor:	0.72	Ceiling Fan (cfm/Watt):	0.00

The Home Energy Rating Standard Disclosure for this home is available from the rating provider.

REMRate - Residential Energy Analysis and Rating Software v14.3
 This information does not constitute any warranty of energy cost or savings.
 ©1985-2013 Architectural Energy Corporation, Boulder, Colorado.

Registry ID: 926566040
Rating Number:
Certified Energy Rater: William D'Arrigo
Rating Date: 10/3/2013
Rating Ordered For: URBANICA DESIGN + DEVELOPMENT

Estimated Annual Energy Cost

Use	Confirmed		
	MMBtu	Cost	Percent
Heating	6.7	\$321	-121%
Cooling	2.2	\$107	-41%
Hot Water	4.3	\$205	-77%
Lights/Appliances	17.4	\$837	-316%
Photovoltaics	-37.6	-\$1812	685%
Service Charges		\$77	-29%
Total	-7.1	-\$265	100%

This home meets or exceeds the minimum criteria for all of the following:
 ASHRAE Standard 90.2 - 1992
 2009 International Energy Conservation Code

Conservation Services Group
 50 Washington Street
 Westborough, MA 1581

E+ Green Buildings

Proven Practice



Annual
Production
+ 8,140 kWh



Sensing & Control in Every Room



Welcome to the City of Boston's E+ Green Building Program. Over the course of a year an energy positive building (i.e. E+) will produce more electricity than it consumes. This is achieved through innovative design, a well-constructed building envelope, and use of high-efficiency windows and heating/cooling systems. Rooftop solar panels and solar thermal water heaters provide electricity and hot water for building occupants.

PERFORMANCE MONITORING

Through a grant from the Massachusetts Clean Energy Center, Embue has installed its sensors and systems in these innovative buildings. For the next three years Embue will track electricity consumption, production, and occupant comfort in each of these model homes. Performance information for each building is provided for the public and can be found in the sections below.

MARCELLA STREET



A four-unit multifamily townhouse building totalling 7,900 square feet. Predicted annual electricity production of 44,400 kWh, consumption of 36,900 kWh, net electricity production of 12,600 kWh.

Photo credit Sam Oberter.

NET ELECTRICITY PRODUCTION

Lifetime	26,186 kWh
Last 365 Days	893 kWh
Year to Date	0 kWh
Last 30 Days	727 kWh

DAILY PRODUCTION & CONSUMPTION

This chart provides daily whole-building performance data for Marcella Street. On days when the green line is above zero, the building is energy positive for that day. For privacy reasons, the most recent data is not displayed.



E+ Green Communities



Building on E+ GB Program

- Two City Owned Parcels
- Community Charrette and Planning Meetings
- E+ GB Goals PLUS
 - Neighborhood Sustainability
 - Place-making and Site Planning
 - Building and Community Sustainability
- RFP Seeking Leading Teams



E+ Green Communities
PROPOSED
DEVELOPMENT SITES

2008 Oblique Imagery
Courtesy of Pictometry Inc.



The City of Boston and the Boston Redevelopment Authority are equal opportunity employers. M/F/V.

E+ Green Communities

RFP Response



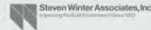
studio garchitects

E+ PARKER TERRACE

studio **g**architects



1 SITE + CONTEXT



E+ Green Communities

Selected Developer
Sebastian Mariscal

Architect / Developer: SEBASTIAN MARISCAL STUDIO

44 Units / 21% Net Positive



E+ Green Communities

RFP Response

Architect / Developer: SEBASTIAN MARISCAL STUDIO



TERRACE ST. PERSPECTIVE

ARTIST'S WAREHOUSE (A-4) INTERIOR PERSPECTIVE



A-4



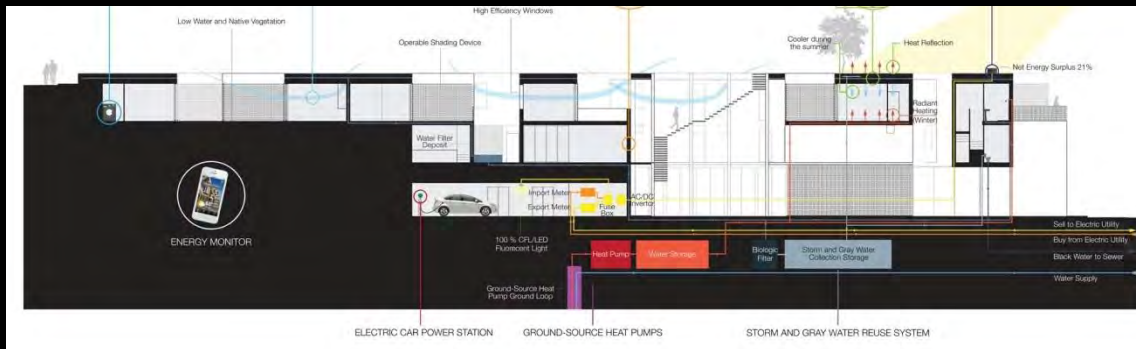
THIRD LEVEL PLAN
1/4" = 1'-0"

- 1. COMMUNITY GARDEN (25,000 SQFT)
- 2. ART ROOM
- 3. PAVILION (14,000 SQFT)
- 4. LEVEL 3 COMMUNITY COURTYARD
- 5. LEVEL 3 PRIVATE PATIO
- 6. LEVEL 2 COMMUNITY COURTYARD
- 7. LEVEL 2 PRIVATE PATIO
- 8. LEVEL 1 COMMUNITY COURTYARD
- 9. LEVEL 1 PRIVATE PATIO
- 10. WATER FEATURE (COMMUNITY GARDEN)
- 11. PAVILION
- 12. HANG-UP PAINT
- 13. DINING/CAFÉ
- 14. COMMUNITY USE SPACES
- 15. BIKE PARKING (50 SPACES)
- 16. BIKE SHED
- 17. RESIDENTIAL STORAGE (40 UNITS)
- 18. TRASH RECYCLING AND RECYCLES
- 19. FIRE EQUIPMENT
- 20. MECHANICAL EQUIPMENT
- 21. ELECTRIC METER
- 22. DATA CENTER
- 23. BATHROOM

E+ Green Communities

RFP Response

Architect / Developer: SEBASTIAN MARISCAL STUDIO



E+ Green Buildings – Residential Market Impact

Private E+ / Net Zero Energy Projects

Dorr Street Residences, Roxbury (completed)

Urbanica Development / Merge Architects



E+ Green Buildings – Institutional Market Impact

Private E+ / Net Zero Energy Projects

Artists for Humanity Addition, Boston

AfH Boston / BEHNISCH Architekten



E+ Green Buildings – Public Leadership

Public / Net Zero Energy

Cronin Field Headquarters, Westborough (completed)

Massachusetts Division of Fisheries & Wildlife / Architerra



E+ Green Communities



HIGHLAND & MARCELLA STREET PARCELS

Development Recommendation:

Four RFPs, Two Small, Two Medium
Parcel Group – Building / Units

A – Small – 2 Family / 2 - 3 Units

B – Medium – Row / 13 - 16 Units

C – Small – 3 Family / 2 - 4 Units

D – Medium – Multi / 12 - 20 Units

TOTAL 40+ UNITS



Zero Carbon

Carbon Free Boston study

- Collaboration with the Boston Green Ribbon Commission (GRC) and the BU Institute for Sustainable Energy (ISE).
- Quantify most effective strategies to reduce energy, buildings, transportation, and waste GHG emissions.

Carbon Neutral Boston 2050

Mayor Martin J. Walsh

Carbon Neutral Cities Alliance

- Collaboration of cities committed to achieving aggressive long-term carbon reduction goals with USDN, INC, and C40.
- Boston and Cambridge – “road mapping” policy, planning, new & existing buildings, time of renovation / sale upgrades.



Given the rapid normalization of high performance building practices how do we keep pace with change?

Given the urgency of the situation can we afford a business as usual progress?

The tipping point is that magic moment when an idea... crosses a threshold, tips, and spreads like wildfire.

Malcolm Gladwell, "The Tipping Point"

Carbon Free Boston 2050; let's go Net-Positive!