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2010 Advanced Energy Conference

Innovative Pathways Toward Low Carbon Society: Policy and Technologies

Functional Net Zero, Carbon Neutral Technologies

Conversion of an Existing Home into a High Performance Ultra-Green Home

Hampton Green Alliance (HGA) House Goals: Net Zero Energy; Embodied Carbon Neutral; LEED Platinum

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Paradigm of Sustainable Building

- Entire Building Life-Cycle
  - Environmental Responsibility
  - Resource Efficiency
  - Carbon Emissions
- Goals
  - Design Efficiency
  - Siting Efficiency
  - Energy Efficiency
  - Water Efficiency
  - Materials Efficiency
  - Indoor Environment Quality
  - Optimize Operations and Maintenance
  - Waste Reduction
  - Deconstruction

- Cost
  - Up Front Cost vs. Life Cycle Cost
    - ROI – Pay Back Period
- Verify
  - Third Party Verification
    - Establish Justification
    - Determine Goals

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Net Zero Technologies in the HGA House

- **Systems Integrated Home™** - Integrate multiple means and methods of design and construction to achieve maximum efficiencies - IPD approach
  - Architect's design
    - Passive Features
      - Increased soffits to maximize solar gain in winter and maximize shading in summer
    - South Facing Orientation
  - High Efficiency Windows
    - Green Mountain Windows (U-Value: .26-.29)
  - Spray Foam Insulation
    - Closed cell in all 2x6 roof rafters, exterior 2x4 walls and headers (R-Value/Inch=6)
    - Open cell in exterior 2x6 walls (R-Value/Inch=3.8)
    - 24" spacing between roof rafters; floor joists to maximize insulation; minimize material and thermal transfer as per LEED
    - Low expansion foam around windows; doors
  - HERS Rating
    - Checks for air leakage in ducts and the house
    - All ductwork is to be in conditioned space
    - All ductwork is to be sealed
    - Caulk all joints to decrease air infiltration
  - Low Flow Fixtures
    - Kohler dual flush toilets
    - 1.5 g.p.m. fixtures
  - Rainwater Harvesting Tank
    - Collect rainwater from gutters used for irrigation
  - LED Lighting
    - CREE 6" LED recessed lights
      - Uses 85% less energy than conventional bulbs
      - 50% less energy than CFLs
      - Designed to last for 50,000 hours
      - Emits very little heat

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- Smart House Technology
  - LED screens on first and second floor to monitor house readings
  - Program certain systems to turn on and off with the alarm
  - Pre wire all rooms and electronics with CAT 5 for future programming
  - Home energy monitoring
- High efficiency wood burning fireplace
  - Clean and efficient burning to minimize heat loss
  - Produces 50,000 BTU/hr
- Energy Star appliances and electrical systems
- Geothermal System
  - Open loop
  - Two stage, variable speed
  - Insulate and seal all ductwork with 181 tape required by HERS rater
- Solar Thin Film
  - South Facing
- Solar Panels
  - East and West facing roof
  - Maximize LIPA rebates
- Solar Thermal
  - Summer Mode
    - Priority- Domestic Hot Water
    - Heat Dump- Pool Dump
      - » Mixes with the return water from pool
  - Winter Mode
    - Priority- Domestic Hot Water
    - Heat Dump- Geothermal System
      - » The excess hot water goes through hot water heating coils to distribute heat through the ductwork to heat house as primary heat source

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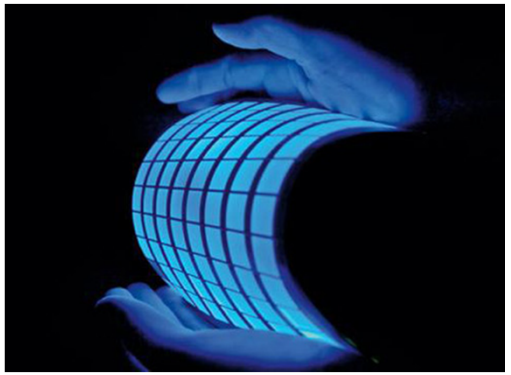
New Technologies Integrated

- LED Lighting
  - CREE LR-6 High Hats
    - Using only 12.5 watts of input power to deliver 1000 lumens, the LR6-DR1000 has unmatched fixture efficacy of up to 84 lumens per watt. It consumes half the energy of a typical CFL downlight while delivering the same light output.
- Micro Inverters for Solar Thin Film PV
- Building Integrated Photovoltaics (BIPV)
- Solar Thermal Winter Mode Heat Dump
- Whole House Monitoring System
  - The Energy Detective (TED)
    - "The Prius Effect"



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HGA House Certified LEED for Homes Platinum

- Innovative and Design Process: 9/11
- Location and Linkages: 6/10
- Sustainable Sites: 10/22
- Water Efficiency: 13/15
- Energy and Atmosphere: 33/38
- Materials and Resources: 10/16
- Indoor Environmental Quality: 20/21
- Awareness and Education: 3/3
- Total Points Certified: 104

- LEED for Homes Platinum Target: 100

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Defining “Green” - Walking the Talk

VERUSCARBONNEUTRAL

certifies that

HAMPTONS LUXURY HOMES
AND ITS SUBSIDIARIES

have offset 100% of their
Carbon Dioxide Emissions.

Verus Carbon Neutral has retired **156** metric tons of CO_2e Offsets from the Chicago Climate Exchange on behalf of Hamptons Luxury Homes and its subsidiaries.

Certified by _____
Expires October 15 2010
Offset Project # SFO-GMF-1447

CERTIFIED CARBON NEUTRAL

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International Carbon Equivalent Mechanism Attributed to Neutrality

CARBON FACT

ICEMAN

CFI

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Embodied GHG in a Window

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Embodied Carbon Footprint of a Home

- **Phase I Carbon Emissions Calculation**
  - Direct Labor and Subcontractors
    - Scope 3 Business Audit of Carbon Emissions
    - Hampton Green Alliance Members – Carbon Neutral
      - Offset 100% Carbon Emissions
    - Non Members – Pro-Rata - Cost Basis
      - Percentage of Contract in relation to Gross Sales (Revenues)
  - Embodied Carbon Footprint of Materials
    - Life Cycle Analysis – Cradle to Gate
  - Transportation of Deliveries to Jobsite
    - Transportation of Labor Calculated in Business Audit
  - Carbon Credits
    - Recycling Waste – Landfill Avoidance – EPA WAste Reduction Model (WARM)
    - Carbon Sequestration of Wood Materials
      - Encapsulation for Life Span of Building

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HGA House Certified Carbon Negative

Removing More Carbon Emissions Than Carbon Emitted

- Phase I Embodied Carbon Footprint = 27 $MTCO_2e$
- Recycling EPA WARM Carbon Credits = 107 $MTCO_2e$
- Net Carbon Offsets Created = 80 $MTCO_2e$
- Carbon Factor Index = 396 (CFI 100 = Carbon Neutral)

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