# DEPARTMENT OF BUSINESS, ECONOMIC DEVELOPMENT & TOURISM

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## DBEDT Study Shows Hawaii BuiltGreen™ Home is More Comfortable

An analysis by the Honolulu Chapter of the American Institute of Architects for DBEDT shows how well the cooling technologies of radiant barrier and natural ventilation in this Hawaii BuiltGreen™ Home (HBG) work to make the home comfortable without air conditioning. In the chart below, temperatures in the HBG were within or close to the "comfort zone" of 73° F – 85° F, whereas the "control house," which was a block away from the HBG but did not have any cooling technologies, was from 10° F to 18° F hotter.

Approximate Temperatures (degrees Fahrenheit) at 5:15 p.m., Sept. 17, 2001 (DBEDT Report 9/2002)

| | Hawaii BuiltGreen™ Home | Control House | **Difference** |
|---|---|---|---|
| Exterior | 84° | 86° | **2°** |
| Attic, Top Position | 88° | 105° | **17°** |
| Bedroom (west-facing) | 84° | 102° | **18°** |
| Dining Room (east-facing) | 84° | 94° | **10°** |

The results of this analysis shows how homeowners can save money and live in comfort without air conditioning if they use the "Three Big Bang Technologies" demonstrated in this Hawaii BuiltGreen™ Home: 1) Utility-approved solar water heating system; 2) Radiant barrier or insulation in the ceiling and walls; and 3) Natural ventilation. These features help keep this home comfortable without needing air conditioning – all for an economical $128,000 (not including the land). If homeowners don't use air conditioning, they can save about $1,320 per year in lower utility bills. A solar water heater alone can save an average Hawaii family of four about $626 per year. Add the savings together and, over 25 years, a homeowner can save about $48,650 (calculated at 14.5¢ per kilowatt-hour; source: DBEDT Energy, Resources & Technology Division).

### *Hawaii's First Energy Efficient BuiltGreen™ Home, and Oahu's First Energy Star® Home**

Waianae Valley, Oahu, Hawaii

| | |
|---|---|
| 4-bedroom, 2 $^1/_2$ bath | |
| Interior floor area: | 1,259 sq. ft. |
| Covered lanai & entry porch: | 106 sq. ft. |
| Garage | |
| Laundry & half bath: | 108 sq. ft. |
| Parking area: | 372 sq. ft. |
| Total: | 1,845 sq. ft. |

Land area: 8,146 sq. ft.

### *Construction:*

Commencement: January 2001

Completion: May 2001

### *Project Partners:*

- U.S. Department of Energy
- State Department of Business, Economic Development & Tourism
- State Department of Hawaiian Home Lands
- Building Industry Association of Hawaii
- Honolulu Chapter, American Institute of Architects
- Hawaiian Electric Company, Inc.
- Honsador Lumber Corporation

*** *Energy Star® Homes*:** *Non-air-conditioned new homes with an Hawaiian Electric Company-approved solar water heating system qualify for an Energy Star® Mortgage, which provides home owners with increased buying power. Call HECO (947-6937) for more information.*

*4/2/2007*

# Features of the First Hawaii BuiltGreen™ Home (Oahu's First Energy Star® Home)

## Design for Site Conditions

1. Orient house to take advantage of the trade winds.
2. Face long side of the house toward north and south to reduce sun's heat in mornings and afternoons.
3. Arrange floor plan and windows to improve cross ventilation and removal of interior heat.

## Design for Energy Efficiency

1. Reduce Energy Consumption
   a. Utility-approved solar water system saves about $626 year. Installation cost reduced by State income tax credits and electric utility rebates. Call HECO (947-6937) for information.
   b. High efficiency refrigerator for additional energy savings.
   c. Fluorescent kitchen/bath/garage lights last longer and reduce energy use.
   d. Microwave oven reduces use of stove oven.
   e. Use effective daylighting to reduce the use of electric lighting during daylight hours.
      1) Larger windows provide better light and ventilation.
      2) Ventilating skylight brightens hall and vents hot air from interior.
      3) White interior and light floor finishes provide better light distribution during the day.

## Design for Comfort without Air Conditioning

1. Insulation, Radiant Barriers, Reflective Finishes, and Shading
   a. Radiant barrier/insulation in the attic to resist heat flow through the roof.
   b. Radiant barrier/insulation in walls help to keep interior cool.
   c. White exterior finish reflects heat, helps to keep the house cool.
   d. White roof reflects heat helps keep house cool.
   e. South wall shaded by carport to reduce heat buildup in the house.
   f. Porch shades east wall from morning sun.
   g. Reduced window area on hot east and west wall reduces heat buildup in the house.

2. Natural Ventilation
   a. Larger windows provide improved ventilation.
   b. Low windows provide ventilation at body level for improved comfort.
   c. Well-separated window openings improve ventilation in rooms with only one outside wall.
   d. Front screen door allows front door to be open for better ventilation.
   e. Louvered interior doors improve air circulation between hall and bedroom/bath areas.
   f. Ceiling fans keep occupants more comfortable on warm and windless days.

3. Vent Heat and Humidity
   a. Kitchen on leeward side of house quickly removes heat and humidity by good cross ventilation.
   b. Kitchen window helps to vent heart and humidity from dishwashing and cooking.
   c. Sliding glass window in kitchen door helps remove heat and humidity from the kitchen.
   d. Vented (to the outside) oven hood helps to remove heat and humidity from cooking.
   e. Ventilating skylight removes hot air from interior.
   f. Ridge vent and vented eaves remove hot air from the attic space.
   g. Laundry in carport reduced heat and humidity in the house.

## Design for Improved Accessibility

1. 3'-6" hall and 32" to 34" wide doors improve accessibility and circulation.
2. Bathrooms 5'-6" wide instead of standard 5'-0" for improved accessibility.

## Design with the Environment

1. Recycled crushed concrete used for fill under garage and drive slabs.
2. Trex™ decking contains recycled plastic materials; resistant to rot, termites, and splitting.
3. Carpet contains recycled content.
4. Concrete caps and metal flashing on foundation piers resist ground termites, reduce need for toxic termiticides.
5. Lumber and plywood in the home are treated with non-toxic borate for resistance to termites.
6. Low-flow fixtures for reduced water use.
7. Improve footings under the house resist settling and structural movement, extending life of house.

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*4/2/2007*