

The New American Home®
Las Vegas, Nevada – 2003

Specifications

- HERS 90 goal, 4.0 ACH at 50 Pa airtightness target
- Low-E solar-control windows, U=0.33, SHGC=0.35
- Spray foam insulation for building airtightness and thermal performance at exterior walls, floors, and underside of roof
- Housewrap weather barrier and building paper
- Heat recovery ventilator delivers fresh air to return plenum in each air handler in unit A
- Fresh air supply distribution ventilation system delivers fresh air to four room locations in units B and C
- Two air handlers with a zone damper system serve unit A; units B and C zoned conventionally
- Ductwork leakage at 25 Pa target varies between 120 and 160 CFM for each HVAC system
- High efficiency air handlers (minimum 90% AFUE) and condensing units (12.2 to 14.2 SEER)
- Heat pump water heaters have an energy factor of 2.4

The New American Home®, an annual showcase project designed by committee and co-sponsored by the National Association of Home Builders' (NAHB's) National Council of the Housing Industry (NCHI) and BUILDER Magazine, is an extraordinary project for Amland Development. Since 1991, Amland has been building architecturally distinctive homes in a variety of settings in the Las Vegas valley. The 2003 New American Home integrates Amland's sense of aesthetics with higher standards of performance and quality into three unique town homes. To design and build homes that are energy efficient, as well as attractive, Amland Development teamed up with Building America's IBACOS Consortium.

In this project, the challenge was to reach a Home Energy Rating System (HERS) level of 90, representing a 50% reduction in space conditioning and hot water energy use. The fact that these homes have such a high level of energy efficiency, when they include so many aesthetic features and lifestyle products, is a tribute to the construction efforts undertaken by Amland Development. The Environmental Protection Agency will present Amland Development with an Energy Star® Certificate for their achievement in these homes.

Amland Development's primary goal for The New American Home® was to establish a high level of energy efficiency for all three homes, while keeping upgrade costs reasonable. Key elements to achieve this goal were deliberate planning and designing for performance, as well as careful attention to communicating design intent to the field crew. Intricate and detailed duct design layout and HVAC optimization and airtightness strategies were developed and implemented. The team at Amland Development provided valuable input and participation at the design and implementation stages that led to a successful project.



Building a very efficient envelope contributed greatly to the homes' efficiency. This performance was achieved in part by maximizing the benefits of spray foam insulation. By placing this insulation throughout the exterior of each home, particularly on the underside of the roof sheathing, the entire home space was insulated and made airtight. Air-handling units and ductwork in an attic space were then no longer subject to the extremely hot temperatures associated with a Las Vegas summer. This allows the heating and cooling equipment to operate more efficiently and be reduced in size while improving performance and homeowner comfort.

Two supply air distribution ventilation systems, each containing an air filter, provide low volumes of fresh outdoor air directly to the living spaces in two of the units. A heat recovery ventilator serves the third unit. In two units, heat pump water heaters use the hot air around them to help heat water efficiently.



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The New American Home® — Primary Goals

-  Build all three high-profile show homes for the International Builders' Show to Building America's energy efficiency level (HERS 90).
-  Introduce production builders to advanced HVAC strategies, mechanical ventilation systems, and advanced insulation and airtightness details.

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Performance Features:

Thermal shell

- R-20 walls
- Low solar heat gain windows

Airtightness

- Spray foam insulation
- Air barrier at roof sheathing
- Penetrations through air barrier sealed

Moisture Control

- "Hot roof" limits condensation potential
- Drainage layer behind stucco finish

Duct Air Leakage

- Mastic sealant used on duct joints or UL181 tape on duct board

HVAC

- HVAC in conditioned space
- Zone control system in unit A
- High SEER AC

Ventilation

- Energy recovery ventilator in unit A
- Fresh air supply distribution ventilation system in units B and C

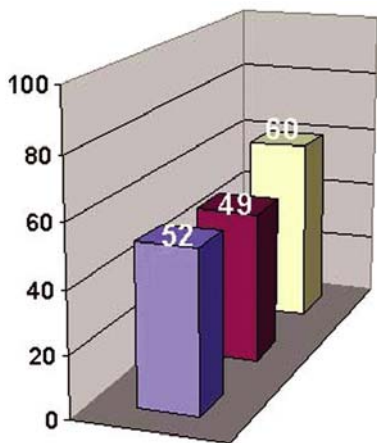
Hot Water

- Heat pump water heaters in units A and B provide domestic hot water

Lifestyle

- Units designed for three different lifestyles: single executive, second home, active retiree

Percentage of Energy Reduction in TNAH



Percentage of Energy Reduction

- Cooling
- Heating
- Domestic Water Heating

As the centerpiece display home for the International Builder's Show, The New American Home® (TNAH) sports qualities unlike that of any other show home. Energy efficient design is a paramount characteristic of TNAH. These homes will use 52% less site energy for cooling, 49% less energy for heating, and 60% less energy for domestic water heating (for the units with a heat pump water heater) than a home of comparable size and orientation. This goal was achieved by maximizing building airtightness and thermal performance to the most practical extent and by using high-performance HVAC equipment. By insulating the roof rafter assembly, the attic space was converted from unconditioned to conditioned space. This allowed HVAC units in the attic to be in conditioned space, which helps to reduce cooling loads.

This section highlights specific features and benefits unique to The New American Home®.



IBACOS, NREL/PIX11960

Spray foam insulation used in exterior walls.



IBACOS, NREL/PIX11961

Spray foam insulation used at the underside of roof sheathing at two locations.



IBACOS, NREL/PIX11962

Supply air distribution ventilation system located in attic space distributes outdoor air to four rooms in the home at volumes that do not adversely affect comfort.



IBACOS, NREL/PIX11963

Air-handling units in attic space are protected from outdoor conditions and can operate more efficiently.



IBACOS, NREL/PIX11964

Extensive efforts were made to seal the air distribution system against air leakage.



IBACOS, NREL/PIX11965

IBACOS is extensively monitoring the homes' performance for a period of one year, while occupied.

Building America's systems-engineering approach unites segments of the building industry that have traditionally worked independently of one another. It forms teams of architects, engineers, builders, equipment manufacturers, material suppliers, community planners, mortgage lenders, and contractor trades.

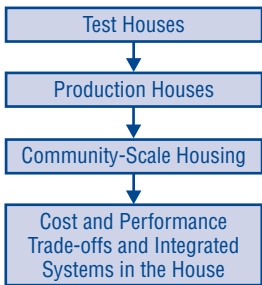
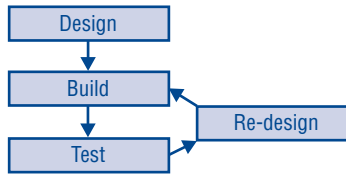
The concept is simple. The systems-engineering approach can make America's new homes cost effective to build and energy efficient to live in. Energy consumption of new houses can be reduced by as much as 50% with little or no impact on the cost of construction.

In order to reach this goal, Building America teams work to produce houses that incorporate energy- and material-saving strategies from design through construction.

First, teams work to analyze and select cost-effective strategies for improving home performance. Next, teams evaluate design, business, and construction practices within individual builder partnerships to identify cost savings.

Cost savings can then be reinvested to improve energy performance and product quality. For example, a design that incorporates new techniques for tightening the building envelope may enable builders to install smaller, less expensive heating and cooling systems. The savings generated in this process can then be reinvested in high-performance windows that further reduce energy use and costs.

The "pilot home" or "test" home is the field application of solution analysis. The team builds this prototype home according to their strategic design, tests each system for efficiency, and makes any necessary changes to increase efficiency and cost effectiveness. Before additional houses are built, these changes are incorporated into the original design. This process of analysis, field implementation, re-analysis, and design alteration facilitate ultimate home performance once a design is ready for use in production or community-scale housing.



Understanding the interaction between each component in the home is paramount to the systems-engineering process. Throughout the design and construction process, careful consideration is made to the relationship between building site, envelope, mechanical systems, and other factors. The recognition that features of one component can dramatically affect the performance of others enables Building America teams to engineer energy-saving strategies at little or no extra cost. System trade-offs, like tightening a shell to enable the use of a smaller HVAC system, can improve the quality and performance of a home without increasing cost to builder or consumer.



Advanced framing systems



Tightly sealed house envelopes



Shorter, less costly ductwork



Disentangling the infrastructure



Smaller, less expensive mechanical systems



Modular construction

Advantages to the Builder



- Reduces construction costs
- Improves productivity
- Improves building performance
- Reduces callback and warranty problems
- Allows innovative financing due to predictably lower utility bills
- Gives builder a competitive advantage

Advantages to the Consumer



- Increases quality without increasing cost
- Increases comfort and performance
- Does not detract from the home's aesthetic value
- Reduces utility bills
- Allows greater financing options

Systems engineering cost-saving trade-offs include:



- Advanced framing systems
- Tightly sealed house envelopes
- Shorter, less costly ductwork
- Disentangling the infrastructure
- Smaller, less expensive mechanical systems
- Modular construction

BUILDINGS TECHNOLOGY PROGRAM

Buildings that are more energy-efficient, comfortable, and affordable ... that's the goal of DOE's Building Technologies Program. To accelerate the development and wide application of energy efficiency measures, the Building Program:

- Conducts R&D on technologies and concepts for energy efficiency, working closely with the building industry and with manufacturers of materials, equipment, and appliances
- Promotes energy- and money-saving opportunities to both builders and buyers of homes and commercial buildings
- Works with state and local regulatory groups to improve building codes, appliance standards, and guidelines for efficient energy use

www.eren.doe.gov/buildings

An electronic copy of this factsheet is available on the Building America Web site at www.buildingamerica.gov

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To learn more about Building America, contact:



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Building America Overview

The Program

The U.S. Department of Energy's Building America Program is reengineering the American home for energy efficiency and affordability. Building America works with the residential building industry to develop and implement innovative building processes and technologies — innovations that save builders and homeowners millions of dollars in construction and energy costs. This industry-led, cost-shared partnership program uses a systems engineering research approach to reduce energy use, construction time, and construction waste by as much as 70%.

The Approach

Building America's systems engineering approach unites segments of the building industry that have traditionally worked independently of one another. It forms teams of architects, engineers, builders, equipment manufacturers, material suppliers, community planners, mortgage lenders, and contractor trades. There are five teams comprising more than 180 different companies.

The Results

Each Building America team is constructing test homes and developing community-scale research projects that incorporate its systems innovations. More than 1,800 energy efficient houses have been built by the teams to date.