

The New American Home[®] 2004

Las Vegas, Nevada

The New American Home[®] is an annual showcase project co-sponsored by the National Association of Home Builders' National Council of the Housing Industry and Builder Magazine. Merlin Contracting built this year's home in the Sahara Lake community, just west of downtown Las Vegas.

To design and build a home that is energy efficient as well as attractive, Merlin Contracting and the home's architect, Lex van Straten, consulted with Building America's IBACOS Consortium. The home is designed to reach a Home Energy Rating System (HERS) score of 90, a score above the current ENERGY STAR[®] minimum rating requirement of 86, and uses a number of high-performance technologies.

Technologies used in this home include a foundation system and above-ground exterior walls of insulated concrete forms to provide excellent insulation for the basement; windows that limit solar heat gain; a roof system built

with structural insulated panels to provide good insulation and airtightness; a heat-recovery ventilator to ensure efficient, good indoor air quality by tempering incoming hot outdoor air with cooler indoor air; and superior efficiency condensing units with a seasonal energy efficiency ratio (SEER) between 14.7 and 16 to provide excellent cooling capacity while using minimal energy.

As a result of these improvements and advanced technologies, the home will use 51% less energy for heating and 54% less energy for cooling than a reference house of comparable size in this climate.

The 5,000-ft² home includes a pool that overlooks Sahara Lake. Special measures have been taken to isolate the pool from the adjacent living space. Other aesthetic features include a loft design that offers versatility for interior design and layout options.

(see The New American Home[®] 2004 on following page)

Specifications

- HERS 90 goal, 0.35 ACH at 50 Pa airtightness target
- Low-emissivity solar-control windows, U-value = 0.38, SHGC = 0.21
- Foundation and above-grade walls of insulated concrete forms that provide airtightness and R-22 thermal performance
- All air-handling equipment within conditioned space
- High-efficiency furnaces (minimum 94% AFUE) and condensing units (between 14.7 and 16 SEER)
- One heat pump with coefficient of performance (COP) of 3.6 and 16 SEER
- Heat-recovery ventilator delivers fresh air to return plenum
- Air-distribution system leakage to the outside target is 3% of system airflow or 216 cfm at 25 Pa

The New American Home[®] Primary Goals

-  Build a high-profile show home for the International Builders' Show to the Building America energy-efficiency level of HERS 90
-  Introduce production builders to advanced HVAC strategies, mechanical ventilation systems, and advanced insulation and airtightness details



Portland Cement Association

Performance Features

Thermal Shell

- R-22 insulated concrete form walls and foundation
- Low solar heat gain windows

Airtightness

- Structural insulated panels provide air barrier at roof sheathing
- Penetrations through air barrier sealed

Moisture Control

- Proper drainage plane

Duct Air Leakage

- Mastic sealant used on all ducts

HVAC

- Mechanical equipment located within conditioned space
- High-efficiency air handlers and heat pump
- High-SEER condensing units
- Heat-recovery ventilator for mechanical ventilation

Hot Water

- Natural gas tank water heater

The New American Home®

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The New American Home® 2004 (cont.)

As part of the Building America program, this home will be used for a number of IBACOS research projects once construction is completed. Building America is a private/public partnership that provides energy solutions for new and existing homes, as well as integrating clean on-site energy systems that will ultimately allow industry to provide homes that produce more energy than they use. The Building America program combines the knowledge and resources of industry leaders with the U.S.

Department of Energy's technical capabilities. Together, they act as a catalyst for change in the home-building industry.

Merlin Contracting has been building custom homes in southern Nevada for more than 10 years. Many of the homes they build typically cover 10,000 ft² in floor area and feature unique architectural designs developed specifically for the community and natural surroundings where they are located.

The New American Home® Features and Benefits

As the centerpiece display home for the International Builders' Show, The New American Home® (TNAH) sports qualities unlike that of any previous show home. Energy-efficient design is paramount. The home will use 51% less energy for heating and 54% less energy for cooling than a home of

comparable size, a goal achieved with minimal cost. For example, thermal performance of walls was maximized to the most practical extent by using insulated concrete forms, and both HVAC units were positioned in conditioned space to reduce cooling loads.



Insulated concrete forms form the walls of the basement.

Insulated concrete forms, steel beams, and structural insulated panels make up the building enclosure.



Steel beams (left) for structural framing are anchored into the insulated concrete form wall, and (right) insulated concrete forms make up the exterior shell of the home.



High-efficiency windows protect the home from air infiltration and solar heat gain.



IBACOS, NREL / PIX12841

UL-181 approved mastic properly seals the entire duct system.



IBACOS, NREL / PIX12819

A view of the underside of the roof shows the structural insulated panels.



IBACOS, NREL / PIX12820

Structural insulated panels provide the air and thermal barrier for the roof.

The display home for the International Builders' Show, The New American Home® (TNAH), exhibits qualities unlike that of any other show home. Energy-efficient design is a paramount characteristic of TNAH. The home will use 51% less energy for heating and 54% less energy for cooling than a reference house of comparable size in this climate. 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 becomes conditioned space. This allows all HVAC units in the home to be located in conditioned space, which helps to improve system performance and reduce cooling loads.



IBACOS, NREL / PIX12803

Expanding foam insulation seals the windows to prevent air infiltration.



IBACOS, NREL / PIX139

Homes use high-efficiency mechanical equipment.

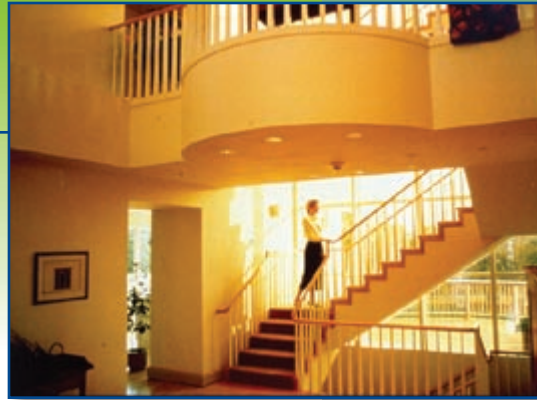


IBACOS, NREL / PIX12838

Commercial registers are used throughout the home to ensure thermal comfort.

Advantages to the Consumer

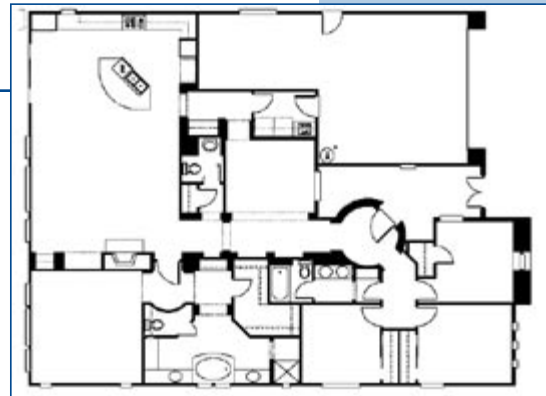
- Increases quality without increasing cost
- Increases comfort and performance
- Reduces utility bills
- Allows greater financing options



IBACOS, NREL / PIX12942

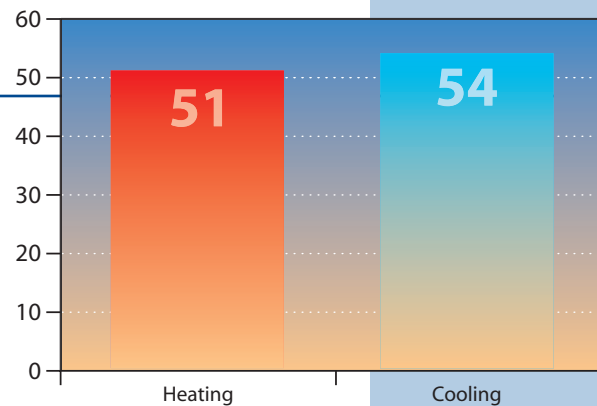
Systems Engineering Cost Saving Trade-Offs

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



Percentage of Energy Reduction in TNAH[®]

- 51%* reduction in heating energy use
- 54%* reduction in cooling energy use



*relative to a reference house of comparable size in this climate

Advantages to the Builder

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



IBACOS, NREL / PIX10746

Systems-Engineering Approach

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

The concept is simple: systems-engineering 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.

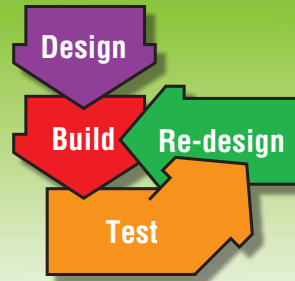
In order to reach this goal, Building America teams work to produce houses that incorporate energy- and material-saving strategies from design through construction.

First, teams 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 incorporating 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 to further reduce energy use and costs.

The "pilot" or "test" home is the field application of solution design. 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 design. This process of analysis, field implementation, re-analysis, and design alteration facilitates 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 design and construction, the relationship between building site, envelope, mechanical systems, and other factors is carefully considered. Recognizing 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.



IBACOS, NREL / PIX12914

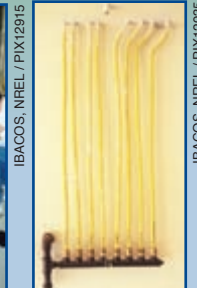


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Achieving High Performance Using A Systems-Engineering Approach



IBACOS, NREL / PIX12915

IBACOS, NREL / PIX12935

Duct leakage is tested using a duct blaster.

This manifold piping distribution system is easier to install than traditional systems.



IBACOS, NREL / PIX12912

High-efficiency water heaters provide ample hot water using less energy.



IBACOS, NREL / PIX12906

Home airtightness is tested using a blower door.

On-site training (left) provides skills to build quality homes. An energy-recovery ventilator (upper-right) ensures good indoor air quality. Open web trusses (bottom-right) provide space within the building enclosure to run electrical wires and ducts.

Research and Development of Buildings

Our nation's 81 million buildings consume more energy than any other sector of the U.S. economy, including transportation and industry. Fortunately, the opportunities to reduce building energy use—and the associated environmental impacts—are significant.

DOE's Building Technologies Program works to improve the energy efficiency of our nation's buildings through innovative new technologies and better building practices. The program focuses in two key areas:

- **Emerging Technologies**
Research and development of the next generation of energy-efficient components, materials, and equipment
- **Technology Integration**
Integration of new technologies with innovative building methods to optimize building performance and savings

A Strong Energy Portfolio for a Strong America

Energy efficiency and clean, renewable energy will mean a stronger economy, a cleaner environment, and greater energy independence for America. Working with a wide array of state, community, industry, and university partners, the U.S. Department of Energy's Office of Energy Efficiency and Renewable Energy invests in a diverse portfolio of energy technologies.



U.S. Department of Energy
Energy Efficiency and Renewable Energy

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



IBACOS, NREL / PIX12935

Optimum value engineering provides the same structural integrity as traditional framing using significantly less material.



IBACOS, NREL / PIX11970

High-efficiency mechanical equipment provides optimum comfort conditions.

Visit our Web sites at:

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