

"A Marriage that Works" - The Linkage Between HERS and Energy Codes

Program Review

- State/Local Economic Impact
- Codes/Performance Evaluation of New Homes in Arkansas
- HIS (Home Improvement as a System) & HERS
- Builders "TUNE-UP"/Partnerships

ARKANSAS ENERGY STATISTICS

65% Leaves the Arkansas Economy

Residential Sector Represents 1.28 Billion

5.2
Total Energy Expenditures
Billion Dollars Spent 1996

3.4
Out-of-State Expenditures
Billion Dollars Spent 1996

2.8
Arkansas Net General Revenue
Dollars Collected - 1996

1994 Energy Code Seal - Residential

- The Energy code has been in effect since June 1, 1995.
- Home builders are responsible for complying with the Arkansas Energy code.
- The adhesive seal must be placed inside the building on the heating or cooling equipment cabinet or the electrical service panel, where it is readily visible to the building occupant and inspectors.

(CABO MEC 1992)

Arkansas Issues

- **Lack of State/Local Enforcement**
- **Codes - Building / HVACR / Energy**
- **Licensure / Education**
- **Supplier / Vendor**
- **Mortgage Industry**
- HUD

Process: Codes/Performance

- **Emphasis on Performance**
- **Understanding building practice and product selection**
- **Give Builders feedback**
- **Future training**
- DOE - Special Projects Grant - Circuit Rider - Field Survey
- Budget - July 1997 - February 2000 (\$109,138.00)
- RFP - Contract - Evan Brown
- 18 Months - Central & NW Arkansas
 - Contact Builders
 - Field Survey
 - Final Inspection
 - Analysis

Energy Performance Evaluation of New Homes in Arkansas

Moving with "Code" to holistic "Performance."

Evaluated:

- Energy (Thermal)Code compliance (ARKcheck)
- Infiltration - Air leakage testing with blower door
- Duct and fireplace leakage by subtraction
- Heating and cooling sizing analysis (Right-J™)
- Building practices/products
- Estimation of annual energy use (REM/Design)

Energy Performance Evaluation of New Homes in Arkansas

- 100 new homes
- 21 builders in NW Ark
- 31 builders in Central Ark

(36 Builders - HBA Members)

•Sq. Ft. Range: 900 – 3500

•Average Conditioned Space: 1928 sq. ft.

• Average List \$: @ \$50,000 + – \$300,000 +

Energy Performance Evaluation 100 New Homes – What We Learned

6 - EPA Energy Star Homes

45 Homes ± 5% of Code

14 Homes ± 10% of Code

- 55 Home passed Energy Code – 45 Failed (CABO/MEC '92)
- No Certification Seals
- Average air leakage .36 NACH
- Average duct leakage 12%
- 90 of 100 homes oversized A/C
- 96 of 100 homes oversized Heating
- Average window area 12.3% (of wall area)
- Average energy costs: \$.59/sq... ft. (\$.50 - \$.70)
 - Average annual energy costs – \$1,088
 - (Ten homes less than \$700.00)
- 80 Homes with slab: 40 failed code energy code
- 36 Homes qualified for HUD financing - 18 failed Code

Infiltration

Energy Performance Evaluation of New Homes in Arkansas

5 years ago the average NACH was 0.55

11 homes had unvented fireplaces -- 7 of those homes had air changes below .35 NACH

◆ **Infiltration:**

- Homes are tighter
- Avg. air change rate: 0.36 NACH
- 5: above .6 NACH
- 2: below 0.2 NACH

Average NACH for homes failing code: 0.373

Average NACH for homes passing code: 0.345

Energy Performance Evaluation of New Homes in Arkansas

Survey Results:

96 of 100 Homes Oversized Heating Systems

◆ **HVAC heating:**

- Avg. AC oversizing: 100%
- 43: between 100% - 200%
- 5: over 200%
- 3: undersized

Energy Performance Evaluation of New Homes in Arkansas

Survey Results:

- ◆ **HVAC cooling:**
 - Avg. AC oversizing: 50%
 - 40: between 50% - 100%
 - 7: over 100%
 - Avg. excess AC purchase price: **\$600**
 - Range of excess AC purchase price: **\$200.00 - 1,700.00**

90 of 100 Homes oversized A/C

Oversizing ranged from .5 ton to 3.5 tons

Performance Evaluation of New Homes in Arkansas

Percent duct leakage

Duct leakage is measured by subtracting from total house leakage. All ducts sealed with mastic had leakage rates below average.

Performance Evaluation of New Homes in Arkansas

Adjusting SEER for field installation

A correctly sized, installed and serviced 10 SEER outperforms a poorly installed and serviced 14 SEER.

HIS (HOME IMPROVEMENTS AS A SYSTEM) & HERS

Recommendations for HERS

For New Construction:

- Incorporate heating and cooling calculations as part of the rating in order to properly size units to the home

OR

- Require that builder provide sizing calculation before crediting the efficiency of the HVAC equipment and...

This would include utility branded home programs, state Energy Code compliance verification and EPA ENERGY STAR Program

HERS should include verification of equipment size to load calculation at final inspection

Performance Evaluation of New Homes in Arkansas

Recommendations for HERS

For Energy Improvement Mortgages:

- If HVAC replacement is determined as "cost effective," require or include load analysis before crediting improved performance in the rating

AND

- Final inspection to include verification of equipment size to load calculation

THE OBVIOUS

- REDUCE LOAD -- PEAK DEMAND
- REDUCE GREENHOUSE IMMISSIONS
- REDUCE EXPORT OF STATE \$\$
- REDUCE UP-FRONT EXPENDITURES FOR BUILDER (or trade-off for higher efficiency in the envelope, lower U-Value or seasonal selected windows, etc.
- REDUCE EXPENDITURE FOR THE OCCUPANTS

Follow-up to the Energy Performance Evaluation of New Homes in Arkansas

BUILDER'S "TUNE-UP" GUIDE

- Reviews Survey Results
- Offers Alternative (Cost Effective) Approaches
- Product Selection/applications
- Communication Tips
- HVACR
- Ventilation
- Manufacturers/Venders/Suppliers
- Links

Follow-up to the Performance Evaluation of New Homes in Arkansas

Recommendations for HVAC contractors:

- Size cooling and heating systems to meet the load (Manual J).
- Seal ducts with mastic/mastic tape.
- Seal and finish the return duct, boots, etc..
- Work with builder on whole system, especially the return duct.

Follow-up to the Performance Evaluation of New Homes in Arkansas

HVAC details requiring builder attention:

- Seal supply boots if not done by HVAC contractor.
- Work with HVAC company to construct better return air ducts.
- Seal and secure inside furnace doors.
- Require HVAC contractors to submit Manual-J calculations.
- Commission the building -- a new trend in delivering customer service.

Follow-up to the Performance Evaluation of New Homes in Arkansas

Other Results:

- **New & Enhanced Partnerships/Alliances**
- **Technical Colleges & Continued Education Credits**

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