

RESEARCH AND IDEAS

Mixed Performance Results for Zoned Cooling Systems

The results of a field study by the National Association of Home Builders National Research Center (NAHB/NRC) show that residential zoning of air conditioning systems can produce a significant **increase** as well as decrease in energy costs, depending on how the system is operated.

The study was performed at the NRC test house in Prince George's County, Maryland, approximately 10 miles east of Washington, DC. The house was divided into three zones — Zone 1 was the second-floor bedroom, Zone 2 was the first floor bedroom; and Zone 3 was the first floor living space.

The 20% extra cost of comfort

As a base case for comparison, NRC researchers first operated the entire house as a single zone from a thermostat located on the ground floor and set to 75 °F. They then switched to zoned control with three separate thermostats, all set to 75 °F.

A comparison of the weather-adjusted energy consumption showed that the house consumed 20% more energy when zoned. Although these results seem surprising at first, the study author, Paul Oppenheim (now at the University of Florida) offered a simple and logical explanation.

The reason for the increased energy consumption is that, with three separate thermostats in the zoned system, the house was more responsive to conditions in individual zones. The system

provided greater comfort to individual zones, albeit at increased energy cost. If, for example, only the upstairs bedroom overheated, the zoned system would cool it. With the non-zoned system, the overheated bedroom would be ignored, since the only operable thermostat was in the main living space.

25% savings with "proper" zone control

In another test, NRC researchers operated the three zones with programmed "setup" for each zone. For example, the bedroom thermostat was set up to 85 °F during daytime periods when it would most likely be unoccupied. (The test house was not occupied). With this control strategy, the house used 25% less cooling energy than in single-zone mode.

This study demonstrated that a simple zoning system can provide energy savings or increased comfort, but not necessarily both at the same time.

For more information, contact Dr. Paul Oppenheim, University of Florida, Gainesville, FL; (301) 249-4000. The study report, titled "Energy Implications of Blower Overrun Strategies for a Zoned Residential Forced-Air System" by Paul Oppenheim will appear in the ASHRAE Transactions 1991, V. 97, Pt. 2, available from the American Society of Heating, Refrigerating, and Air Conditioning Engineers, 1791 Tullie Circle NE, Atlanta, GA 30329; (404) 636-8400. ♦

More Non-Savings From Radiant Heating Systems

A field survey performed in 1962 at the University of Illinois found no measurable difference in energy consumption between houses with electric radiant ceiling heat and electric baseboard heat. It also showed no better temperature distribution with radiant ceiling heat than with electric baseboards.

The primary purpose of the Illinois study was not to study radiant heat, but rather to compare calculated versus measured energy consumption for typical occupied houses. However, since the study included houses with both radiant ceiling and electric baseboard distribution, the results provide interesting comparative data.

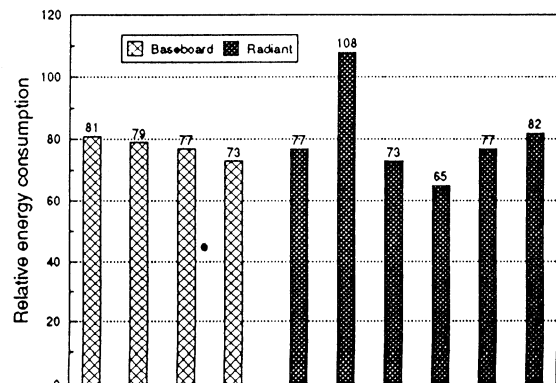


Figure 1 — Measured heating energy consumption of occupied houses with electric radiant ceiling heat versus electric baseboard heat distribution. The vertical axis in the graph is measured energy consumption as a percentage of calculated energy.