Any wall and ceiling contractor who sees no energy impact on the single house residential market simply hasn’t been looking. Using current technology and building materials already on the market, home building designers have designed a 1,200 sq. ft. three-bedroom home expected to consume 1/3 to 1/2 less energy than a typical single-family home of comparable size.

The Energy Efficient Residence (EER) was built near Washington, D.C. under contract with the Department of Housing and Urban Development by the NAHB Research Foundation, Inc., of the National Association of Home Builders.

“We have designed and built this home to measure whether it provides a practical and economical approach to energy conservation in high energy cost areas” said Ralph Johnson, President of the Research Foundation. “Preliminary estimates indicate that additional construction costs for this type of house will run about $3,000.”

Cost Effective

“The energy saving products and techniques used in the home are cost-effective; that is, they will pay for themselves within a reasonable period of time because of the savings in energy costs accumulated by the homeowner over several years,” said Donald Luebs, the engineer who headed the project. “Furthermore, most of the materials and procedures we used here can be adopted by contractors today without major changes in their construction operations or home designs.”

The all-electric home is heated and cooled by one of the smallest but most efficient heat pump systems on the market today. There is 6 inch (R 19) fiberglass batt insulation as well as 1 inch (R 5) foam sheathing in the walls and 12 inch (Continued on Page 44)
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(R 38) batts in the attic. Ceiling heights are 7 feet 6 inches instead of the normal 8 feet.

The exterior of the home is composed of brick and aluminum siding.

Inside, an unheated foyer is completely cut off from the rest of the house, creating an air lock which prevents energy loss when the front door is opened. Magnetic weather stripping is used as well to reduce drafts and leaks around the steel, insulated doors.

The foyer and a storage space provide a six-foot wide buffer between the living area and the outside.

The living room adjoins a comfortably sized family retreat area—a combination family room and eat-in kitchen. The family retreat, which can be closed off from the living room by large double doors, has a highly efficient fireplace unit with glass doors that can be closed to prevent heat loss up the chimney.

Retreat Saves

“The family retreat, if used to its potential, could save a family a substantial amount in heating costs over the years,” Luebs said. “During the cold winter months a family could light a fire and turn down the thermostat for the rest of the house.”

The kitchen is equipped with the most efficient appliances on the market, including a range with microwave oven, a highly efficient refrigerator and an energy-saving dishwasher. All the faucets and shower heads in the home have water-saving features.

The family retreat also has the best view. Large triple-glazed windows, facing south for solar gain, overlook the backyard. A two-foot roof overhang provides shade during the summer. All windows in the house have insulated draw drapes.

Since a great deal of energy is lost in typical homes through cracks and holes in walls and ceilings, NAHB Research Foundation engineers used surface mounted electrical outlets on the outside walls to avoid penetrating the wall.

In the hallway leading to the bedrooms is the thermostat and a special digital meter that continually tells the homeowner how much he is spending on energy to heat or cool the home or to run any of the appliances.

“To a great extent energy conservation in the home depends on living habits,” Luebs said. “Once a family begins to use this meter and realizes how much it is costing them for some of their living habits, we expect that they will eliminate the more wasteful ones.”

An insulated steel door in the basement—instead of a less efficient sliding glass door—leads to the backyard. Framing of 2” x 3” studs is positioned three inches out from the basement walls to allow for six inches of insulation. Perimeter foam insulation isolates the basement slab edge from the block foundation wall.

The home is equipped with a heavily insulated, 52 gallon water heater, which is set back to 120 degrees F. While it might be difficult for each person in a family of five to take a shower within a half hour period, the water tank is sufficient to meet a family’s normal needs, Luebs said.

Insulated Pipes

Both hot and cold water pipes are insulated to reduce heat loss and to avoid condensation.

A unique feature of the heat pump system is that the compressor is located inside the home. This permits the summertime use of a special heat recovery device that utilizes waste heat, extracted from the home, for water heating. Another advantage is that inside placement protects it from the elements and prolongs its life. In the event of a malfunction during the winter it can be easily serviced.

Because the home is so energy efficient, the duct system is greatly simplified. A small trunk duct runs down the middle of the house. It wasn’t necessary to run branch ducts to the outside walls of the home. All duct outlets in the upstairs living area are located on inside walls. Each of the rooms except for the family retreat and living room is heated and cooled by only one outlet.

A dozen meters have been installed in the basement to keep tabs on the energy ‘usage of the different appliances and heating, cooling and water heating systems in the house.

Once this home is occupied, NAHB Research Foundation engineers will monitor the energy performance of this EER home, and compare it to a similar conventional home.