ard by which similar commercially-developed programs are evaluated. DOE-2 has been used in the development of building industry standards, such as the American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE) Standard 90, the California Building Code, and the ASHRAE *Handbook of Fundamentals*; as an aid in developing simplified analytical tools (ADM-2, Trackload, ASEAM, BLAST, and PEAR); and as an educational tool to train engineers, designers, and architects. Since its release in 1977, several hundred copies of DOE-2 have been distributed. DOE-2 is recognized in the technical community as the most accurate building energy simulation program available.

Flame Retention Oil Burner

The high-efficiency flame retention head oil burner, although not a new technology, did not achieve substantial penetration of the oil heating market until DOE investigated its potential in the late 1970s. In a carefully controlled field test, DOE established the energy conservation benefit of this oil burner by studying retrofit options, including the use of the burner alone or in combination with other measures. A second DOE effort communicated the findings of this research through the distribution of over 70,000 copies of a consumer-oriented information booklet to the public. This booklet covered the energy conservation aspects of flame retention oil burners and other components of oil-fired heating systems. As a result of these efforts, the number of flame retention head oil burners in use increased from 100,000 in 1979 to over 2,000,000 in 1985, saving approximately 44 trillion Btu annually. The flame retention head oil burner is projected to save 0.14 quads annually by the year 2000.

Infiltration Model

Infiltration, the uncontrolled flow of air through a building's shell, is responsible for one-third to one-half of residential and commercial building energy requirements. Prior to 1980, no adequate method existed to predict energy losses due to infiltration. To meet this need, DOE sponsored the development of an infiltration model that provides simplified techniques for estimating infiltration rates in residential buildings based on building envelope parameters and climatic conditions. To predict the performance of air infiltration in the building shell, the model uses the leakage properties of the building envelope and site weather data. The model is simple enough to use with a hand calculator and is usually accurate to within 20 percent of actual figures. Described in detail in the ASHRAE *Handbook of Fundamentals*, the infiltration model is currently being used throughout the professional design community and has been incorporated into major energy performance computational programs (CIRA, DOE-2, BLAST, and TRNSYS). Residential building designs that incorporate the results of the infiltration model are typically 10-15 percent more energy efficient. The residential infiltration model is currently being extended to analyze infiltration in commercial buildings.

Insulation Thermal Resistance Measurement

The National Institute of Standards and Technology (NIST) has conducted research on heat transfer through insulation for many years. Following the energy crisis of the 1970s, insulations with thicknesses increased by more than an inch were incorporated in many building designs. At that time, test methods to evaluate the properties of these thicker insulations did not exist. In 1978-1979, the FTC proposed a plan to require manufacturers to label insulation material for thermal resistance and to base advertised thermal resistance values on product testing. Because precise measurement of the thermal resistance of thick, low-density insulation is difficult, DOE and NIST co-sponsored the development of the 1 meter line-source guarded hotplate to accurately measure insulation performance. This device is capable of heat transfer measurement in insulation up to 15 inches thick. The insulation industry was given calibration trans-