



## INSULATION CONTAINMENT APPARATUS – THE ULTIMATE R

### New System Reduces Heat Loss or Gain in HVAC Duct Work in Attics

#### Benefits

- ◆ Provides energy savings from increasing insulation value to R-38
- ◆ Is easy to install for novices or professionals
- ◆ Addresses both duct leakage and conductive loss in attic duct systems

#### Applications

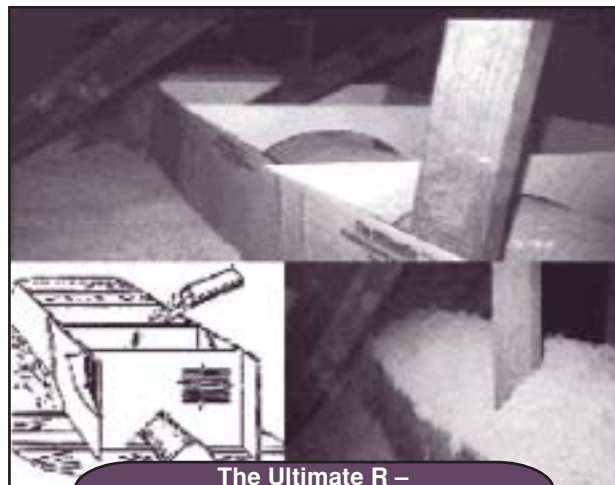
Method of adding up to R-38 of additional insulation to HVAC ducts in attics of new or existing homes.

#### Capabilities

- ◆ Significantly increases the insulation value of ductwork
- ◆ Does not disturb the ducts and distributes insulation uniformly around the ducts
- ◆ Can be easily installed in new or old buildings

Currently, the most common method of adding insulation to existing heating, ventilating, and air conditioning (HVAC) ducts is to wrap the ducts with a blanket or batt of insulation. Another less common procedure is adhering insulation board to the ducts and taping the joints. Research shows that these methods appear to be somewhat limited in the thickness of insulation that can be added but are acceptable for suspended ducts which are usually found above drop ceilings, in basements, and in crawl spaces. Furthermore, insulation blankets, batts, or boards are often placed over the tops and sides of existing ducts, with no attempt made to seal the insulation joints or to effectively snug them to the air duct's outside surface. This method raises the issue of insulating effectiveness.

A new method of adding insulation to HVAC ducts in attics was developed by Theron Crall, Jr., with the aid of a grant from the Inventions and Innovation Program. This invention called the Ultimate R is a new method of adding up to R-38 of additional insulation to HVAC ducts installed in an unconditioned attic of either existing (retrofit) or new construction applications. To install this invention, the ducts must be very close to level and located on the attic floor. The system consists of a series of moisture resistant light-weight corrugated cardboard cells which can be placed around existing un-insulated or inadequately insulated HVAC ducts. The cells interlock so they form a continuous "trough" which is filled with loose fibrous, or cellular insulation. These cells act as containment devices to keep the loose-fill insulation packed around the top and sides of the ducts for uniform thickness and maximized thermal insulation.



The Ultimate R –  
Insulation Containment Apparatus



The Ultimate R addresses both duct leakage and conductive loss by: requiring that the duct air leaks be sealed before the insulation is installed, and providing full R-38 insulation uniformly around the ducts. The Ultimate R is a simple method of insulating duct work that can be installed by "professional" insulators as well as "do-it-yourselfers."

## Energy Savings and Pollution Prevention

A study was conducted in which three homes were retrofit with the Ultimate R duct insulation system. The average annual energy savings, accounting for heating only, were 10.3 MBtu. An estimated million miles of ducts run through homes across the United States. These ducts are located in unconditioned spaces in over 15 million single-family households. It is also estimated that more than 80% of these households would benefit from reducing duct leakage and increasing insulation around the ducts. If 25% of these homes improved their HVAC system with the Ultimate R, national annual energy savings of 40 million Btu could be possible.

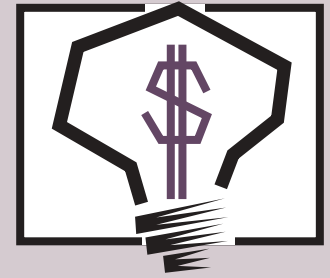
## System Economics and Market Potential

The cost of installing the Ultimate R in a typical 1,400-square-foot single-story home will be \$200 to \$400, with estimated paybacks ranging from 1.3 to 2.6 years. The lower cost applies if the owner does the installation. Sales through 2000 have exceeded 2000 linear feet.

The key to successful market acceptance is in targeting geographical regions and applications that are best suited for duct insulation. Current markets being targeted are do-it-yourselfers through distribution and promotion at home repair centers; HVAC manufacturers who would incorporate the Ultimate R with their systems; progressive utilities, energy offices, and energy extension offices; and government and military institutions.

### **INVENTIONS AND INNOVATION PROGRAM**

*The Inventions and Innovation Program provides financial assistance for establishing technical performance and conducting early development of innovative ideas and inventions. Ideas that have a significant energy-savings impact and future commercial market potential are chosen for financial support through a competitive solicitation process. Inventions funded by the program have saved enough energy to light 10 million homes per year. In addition, the program offers technical guidance and commercialization support to successful applicants. Ideas that benefit the Industries of the Future, designated by the Office of Industrial Technologies as the most energy-intensive industries in the United States, are especially encouraged.*



"DOE was instrumental in getting the Ultimate R off the ground."

– Theron Crall, Jr.  
Inventor  
The Ultimate R

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