

## Unvented Attic Retrofit Applications

In existing homes, where HVAC equipment and duct work are located in a vented attic space, the energy performance of the house can be improved by converting the vented attic into an unvented attic<sup>1</sup>.

With the vented attic the HVAC equipment and duct work will be exposed to high temperature and humidity which will reduce the operating efficiency of the equipment and any duct leakage will be lost to the outdoors. Following a retrofit the unvented attic will become an indirectly conditioned space which will place the HVAC equipment and duct work in lower humidity and temperature, typically within 5 ° F of the living space below and all duct leakage will now be into conditioned space. This will serve to improve the operating efficiency of the HVAC system and reduce the effect of duct leakage. The result is an overall increase in energy performance for the building.

In the unvented attic retrofit application the underside of the roof deck and vertical walls in the attic can be insulated and air sealed with Icynene<sup>®</sup>. With a maximum insulation thickness of 10" on the underside of the roof deck and 3 ½" on the walls no ignition barrier or intumescent coating is required over the insulation. With 3 ½" to 6" on the walls SafeCoat Latex or Aldocoat 757 is required as an intumescent coating over the wall insulation, just the on the wall insulation, not on the underside of the roof insulation.

Icynene<sup>®</sup> can be left bare in the attic where there is limited access only for the service of utilities, equipment related to electricity, natural gas, water, sewage and telephone. Limited access typically means an attic hatch where a ladder would be required to gain access or pull down stairs for attic access. If there is a fixed stair case up to an attic space door or the attic is used for storage it can be deemed as occupied space by the code official and the insulation would need to be covered with a thermal barrier, such as ½" dry wall.

Air in the attic is not circulated to other parts of the building. If the attic is a plenum area it will be considered to be occupied space and a thermal barrier cover is required over the insulation<sup>2</sup>.

1. Unvented attic case study showing energy performance improvements.  
Article written by the Building Science Corp.
2. ICC-ES ESR-1826 report: section 4.4.2.3

All existing vents in the attic need to be sealed and covered with Icynene<sup>®</sup> to insure that there is no air flow into the attic space.

Insulation that exists on the floor of the ceiling and any vapor retarder on the floor of the ceiling should be removed to allow for heat and moisture transfer through the ceiling. This is how the unvented attic space becomes indirectly conditioned space and the temperature and humidity in the attic can be controlled.

Typically the project may involve a wood framed house that has been insulated with air permeable insulation and the air infiltration rate will still be in excess of 0.35 ACHn after Icynene® has air sealed the attic space. With an air infiltration rate greater than 0.35 ACHn a mechanical ventilation system would not need to be added to the house. The building owner should contact his HVAC contractor to obtain an evaluation of the HVAC system to see if any changes to the HVAC system are required. The HVAC Contractor should determine whether the size of the existing HVAC system needs to be changed or whether additional dehumidification or ventilation is required.

A naturally aspirated furnace cannot operate within an unvented attic and draw combustion air from the unvented space. A two pipe condensing gas furnace should be used with one pipe for combustion air and the second pipe for exhaust. A vent pipe cannot be run from the exterior up beside the furnace air inlet. This will allow for unrestricted spillage of air into the attic and the indirect conditioning of the attic will be lost. The energy performance improvement will be lost.

If the house has been built with air impermeable materials such as SIP or ICF walls mechanical ventilation may need to be added. The HVAC contractor needs to make an assessment of the ventilation of the house. A blower door test may be required to determine the natural ventilation rate, and any other recommendations per the HVAC Contractor.

The insulation in the attic must be separated from the living space below by a thermal barrier material. A ½" dry wall ceiling provides this requirement. A suspended ceiling would need to have at least a 15 minute rating to provide the thermal barrier requirement. If an unrated ceiling assembly is in place it would be necessary to coat the insulation in the attic with a thermal barrier material or to replace the ceiling with a minimum 15 minute rated assembly.

The code requirements for an Icynene® insulated unvented attic assembly are outlined in section 4.4 of our ICC-ES, ESR-1826 Report. Icynene® has been used in unvented attic assemblies for over 15 years. These systems continue to perform very well and generate substantial energy savings.

An Auto/CAD drawing for an unvented attic assembly is attached. If there are any questions regarding the retrofit application please call the Icynene Engineering Department-Building Science @ 1.800.758.7325.