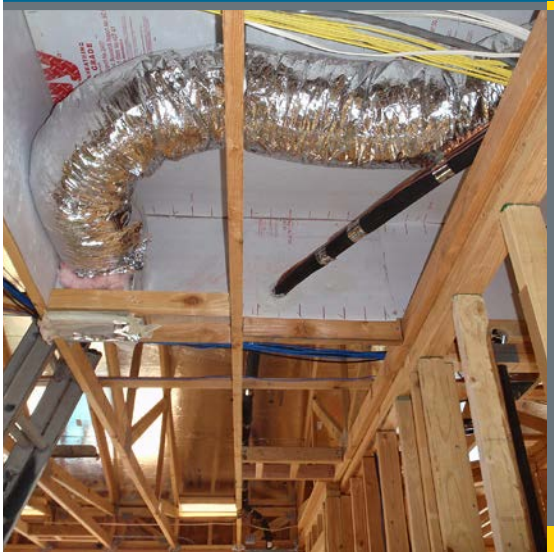


Building America Case Study

Whole-House Solutions for New Homes

Inverted Attic Bulkhead for HVAC Ductwork

Roseville, California

PROJECT INFORMATION

Project Name: Long-Term Monitoring of Occupied Test House

Location: Roseville, CA

Partners:

K. Hovnanian® Homes®,
www.khov.com

IBACOS
www.ibacos.com

Building Component: Envelope, structural, HVAC ducts

Construction: New

Application: New; single and/or multifamily

Year Tested: 2012

Applicable Climate Zone(s): Hot-dry climate

PERFORMANCE DATA

HERS Index: 52

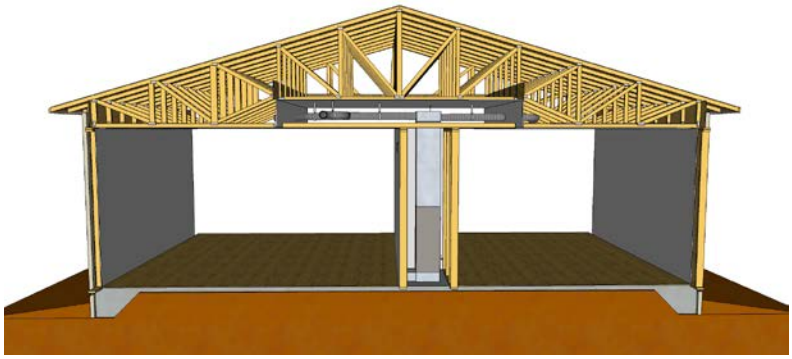
Projected Energy Savings:

11 million Btu/year heating and cooling savings

Projected Energy Cost Savings: $116/year

Building America SM U.S. Department of Energy

Modifying the truss system of a new home to accommodate ductwork within an inverted insulated bulkhead along the attic floor can save energy by placing heating, ventilating, and air-conditioning (HVAC) ductwork within the home's thermal boundary. U.S. Department of Energy Building America team IBACOS monitored the performance of a new 2,253-ft^2 single-story slab-on-grade ranch house with three bedrooms and two full bathrooms constructed in Roseville, California, for one year as an occupied test home. The air handling unit for this low-load house in a hot-dry climate was relocated from the unconditioned attic to a central location inside the conditioned space of the house.



Conceptual representation of the system

The reverse attic bulkhead is placed over the HVAC equipment closet with the approximate area of the cavity created by a new truss design used to create an unobstructed space to accommodate the ductwork. The following should be verified to ensure that the compact duct distribution system is properly designed and implemented:

- Verify truss modifications meet engineering requirements for load bearing.
- Verify the bulkhead is adequately sized to accommodate the ductwork.
- Verify all penetrations and intersections in the bulkhead are carefully sealed.

DESCRIPTION

To effectively implement the reverse bulkhead approach, one important factor is that the redesigned truss must not affect the bearing location at the footing level.

The original design, as shown below in the upper image, can be modified to the proposed design, as shown in the lower image.

Original design

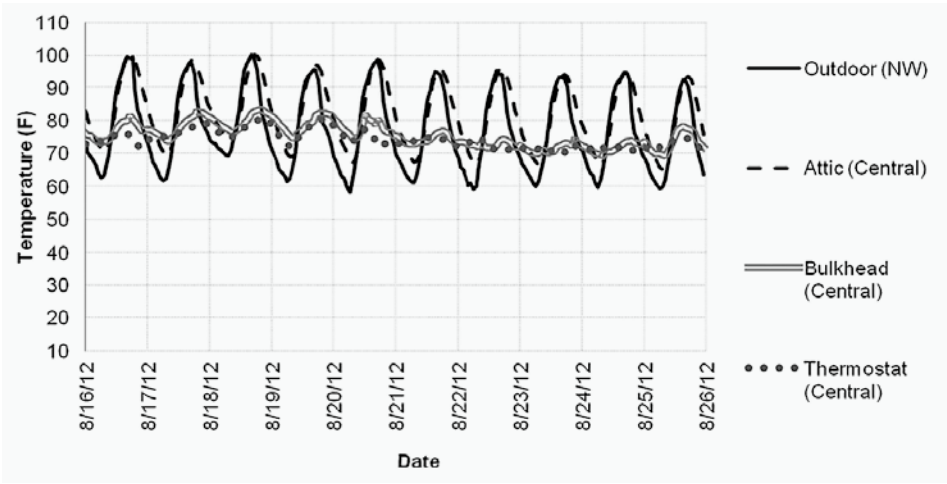
Modified design

The modified design can provide a centrally located chase along the floor of the attic.

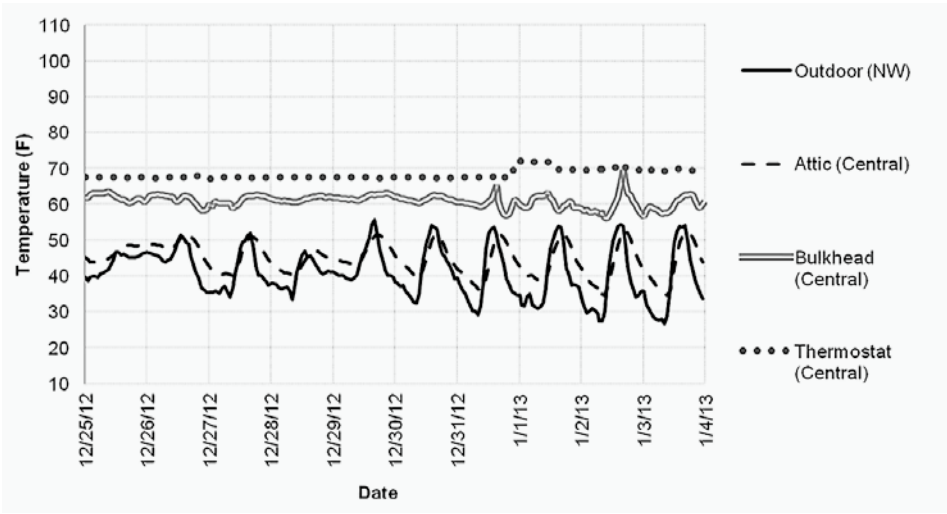
In this example, to provide a central bearing location that was consistent with the existing structural design for the home, a framing member was dropped from the truss web to bear on the interior load-bearing partition wall.

For more Information, see the Building America reports, *Short-Term Monitoring Results for Advanced New Construction Test House- Roseville, California, Strategy Guideline: Compact Air Distribution Systems,* and *Measure Guideline: Implementing a Plenum Truss for a Compact Air Distribution System,* at *www.buildingamerica.gov*

Image credit: All images were created by the IBACOS team.



Bulkhead temperatures relative to indoor and outdoor temperatures in the cooling season



Bulkhead temperatures relative to indoor and outdoor temperatures in the heating season

Long-term monitoring shows that temperatures inside the bulkhead, in both the cooling and heating seasons, run close to the thermostat set point and are isolated from the vented attic extemes. The differences, particularly during the heating season, point to the continued need for insulated ductwork for this scenario.

Lessons Learned

- Inside the thermal boundary is different than inside conditioned space. Insulated ducts are still necessary.
- Involving the truss manufacturer early in the design can help resolve any structural bearing issues.

U.S. DEPARTMENT OF ENERGY
Energy Efficiency & Renewable Energy

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www.buildingamerica.gov

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