Building America Case Study

Evaluation of the Performance of Houses With and Without Supplemental Dehumidification in a Hot-Humid Climate

New Orleans, Louisiana

PROJECT INFORMATION

Project Name: New Orleans Dehumidification Study

Location: New Orleans, LA

Partners:

Project Home Again

Building Science Corporation, *buildingscience.com*

National Renewable Energy Laboratory, *nrel.gov*

Mountain Energy Partnership

Building Component: Supplemental dehumidification

Application: New; single- and multifamily homes

Year Tested: 2012–2013

Applicable Climate Zone: Hot-humid

PERFORMANCE DATA

Cost of energy efficiency measure (including labor): $1,500

Projected energy savings: No predicted energy savings, but increase in comfort

Projected energy cost savings: None

Building AMERICA SM U.S. Department of Energy

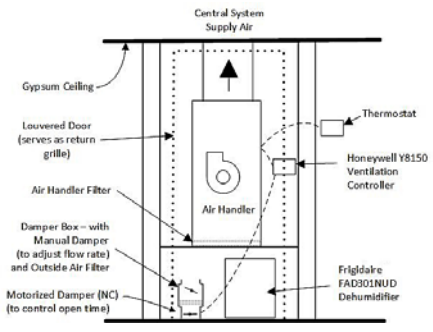
This case study addresses the measure of supplemental dehumidification systems in single-family homes. New high performance, low-energy homes, with improvements in materials and construction quality, have greatly reduced their heating and cooling loads. Evidence suggests that reduced cooling operation can diminish humidity removal, which elevates humidity levels in hot-humid climates. This is especially true during shoulder seasons, when the cooling system operates infrequently. Therefore, the U.S. Department of Energy's Building America team Building Science Corporation (BSC) has been recommending the installation of a separate dehumidifier that can control humidity levels without cooling operation.

BSC conducted this study to evaluate the performance of new homes in a hot-humid climate, with and without supplemental dehumidification systems. Ten homes with similar floor plans and energy-related characteristics (four with ducted dehumidifiers, two with standalone dehumidifiers, and four with no dehumidifiers) were outfitted with a monitoring system that can measure the interior and heating, ventilation, and air conditioning (HVAC) system conditions and the energy use of most major appliances and HVAC systems. The intent was to compare the performance of the two house types and observe any trends on interior humidity control.

A trend in the data suggested that humidity levels were being controlled better in homes with dehumidifiers, but both groups of houses showed exceptions. No single explanatory variable appeared to provide a consistent understanding of the humidity control in each house. One factor that could explain the lack of elevated humidity levels in homes without dehumidifiers is that the ventilation system was configured to operate at only one-third of the ASHRAE 62.2 rate. Previous work has identified high performance homes in a hot-humid climate with elevated indoor humidity levels when ventilating to the ASHRAE 62.2 rate. Another contributing factor was that the dehumidifier set points were altered by some homeowners.

Description

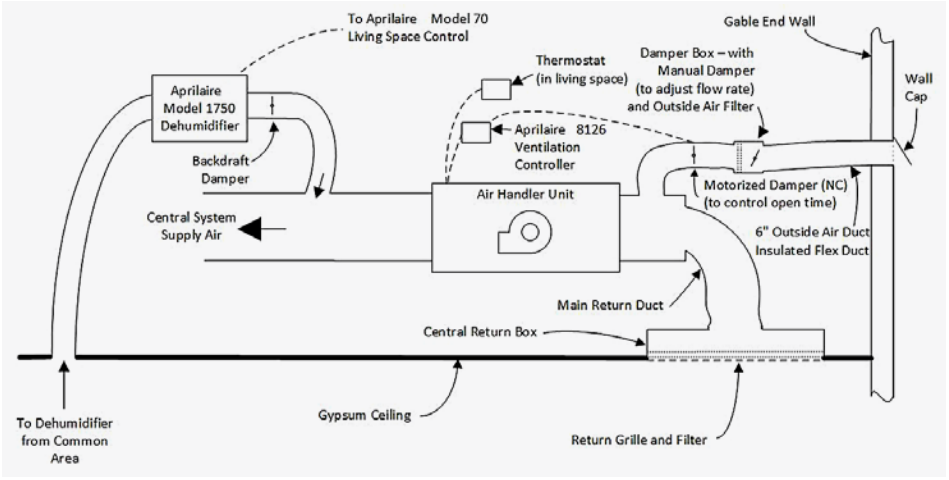
The photo on the front page shows the whole-house ducted dehumidifier that was installed in the unvented cathedralized attic at four of the eight Project Home Again houses. A schematic of the design is shown on the right.



The two Broadmoor Development Corporation houses also installed supplemental dehumidification; however, these standalone dehumidifiers are located in the open return of the HVAC system, which is in a mechanical closet. The image above shows the schematic design and the photo below shows the dehumidifier installed in the open return with the outside air duct and filter/damper box on the left-hand side.

For more Information, see the Building America report, *Evaluation of the Performance of Houses With and Without Supplemental Dehumidification in a Hot-Humid Climate,* at: *buildingamerica.gov*

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



Four homes used a whole-house ducted dehumidifier that was installed in the unvented cathedralized attic and integrated with the horizontally oriented air handler such that its output was connected to the supply plenum of the HVAC system. This was to allow for fan cycling to mix and distribute the dehumidified air. It also allows the dehumidifier to operate on its own without forcing concurrent air handler operation.

Lessons Learned

- Ensure the dehumidifier set point is adequate for the intended performance.
- Improve homeowner education on dehumidifier operation and controls.
- Develop improved data logging methods for monitoring occupant behavior.
- A standalone dehumidifier installed costs $150; a whole-house ducted dehumidifier installed costs $1,500.

Looking Ahead

Elevated indoor humidity levels in high performance homes are likely due to all the factors BSC examined, their interactions, and the specifics of how they are used by each occupant. The magnitude of this variability, and the difficulty encountered in finding explanatory variables, are important findings with implications for future research.

A more accurate and easily transferrable metric should be developed for evaluating the extent of humidity problems in high performance homes to determine the need for supplemental dehumidification.

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

For more information, visit:
buildingamerica.gov

The U.S. Department of Energy's Building America program is engineering the American home for energy performance, durability, quality, affordability, and comfort.

DOE/GO-102014-4481 • November 2014