

Manufacturer: BASF Foam Enterprises  
Product(s): Comfort Foam; Enertite US  
Category: Building Insulation



Reducing energy use in buildings is ultimately predicated on reducing the energy loads as much as practical so that the systems that consume energy, such as heating and cooling have less work to do and therefore use less energy in accomplishing their tasks. It should come as no surprise that for this strategy to work in the hot-dry Las Vegas climate with its extreme summer heat, reducing the cooling load is a priority. To accomplish this, wall and roof insulation are especially critical, both in providing the needed R-values, and in preventing unwanted air-infiltration.

Before retrofit, the 1960's vintage ReVision home used conventional fiberglass batt insulation both in the 2 x 4 walls and in the 2 x 10 roof rafters. A small vented attic space, containing the heating and cooling ducts was insulated at the attic floor and the vertical knee walls leaving the ducts in 120-140 degrees F unconditioned space. Pre-retrofit testing revealed numerous significant gaps in the insulation and very high levels of air-leakage. A different approach was needed to obtain the ambitious performance goals set by the ReVision team.

Using EnergyGauge USA modeling software, the optimal insulation values were established. Given the small cavity spaces available for insulation in the existing framing, and the need for excellent air-sealing, the project team reviewed the options and settled on two different forms of spray-polyurethane foam: open-cell foam for the walls; and closed-cell foam for the roof. Working with BASF Foam Enterprises, open-cell Enertite® US was specified for the walls and Comfort Foam® 178 was selected for the roof.

In treating this project as a deep-energy retro-fit, rather than a gut rehab (and theoretically allowing the home to be occupied through most of the process) it was decided to install the foam insulation from the outside leaving the interior gypsum board and finishes in place. The time-abused original stucco and wood siding were removed exposing the 2 x 4 framing and interior drywall (no structural sheathing was employed in the original construction). Following isolated changes to the existing wiring, the 2 x 4 cavities were foam-filled, with the surface of the foam raked flush with the outside edge of the framing. ½" OSB structural sheathing was then added to seal the cavities and provide lateral support (Las Vegas is in a high-risk seismic zone). With the 3-1/2" space and an aged R-value of 3.9 per inch, the Enertite® foam yields R-13.65 for the cavity with exceptional air-sealing qualities. In addition to this 2" of BASF Styropor® EPS insulation boards were applied over the OSB and housewrap as the base layer for the new exterior-insulation-finish-system (EIFS), resulting in a total whole-wall R-value of 20.83.

The roof insulation presented additional unique challenges and opportunities. Before renovation the cooling load from the roof assemble was immense with poorly installed insulation, plenty of air-leakage paths (over a dozen non-sealed can-lights), and ineffective venting. In order to obtain the R-values desired, seal the air leaks, and not adversely affect the architectural character by adding a thick layer of insulation above the decking, closed-cell Comfort Foam® 178 was specified. Working from the exterior, to leave the ceiling finishes in place, the existing roll-roofing and decking were removed exposing the 2 x 10 rafter cavities. At the sloped ceilings, Comfort Foam® was sprayed against the gypsum board to a final depth of 8.5". At the small attic space, furring strips and ledgers were added at the bottom of the rafters to support gypsum board fillers providing both a surface to foam against and the required thermal barrier for foam of this thickness. This strategy also places the small attic space within condition space providing a far more energy-efficient context for the HVAC ducts. With an aged R-value of 6.9 per inch, the full assembly yields an exceptional R-58.65, and goes a long way in reducing total cooling and heating loads on the building envelope.

Replacing the existing obsolete insulation with high performing BASF spray polyurethane foams is a critical ingredient in approaching net-zero whole house performance for the ReVision House, and on its own contributes a significant percentage of the overall energy savings.

