

Colorado House Equipped with New Peel-and-Stick Photovoltaic System

A pair of Colorado-based companies has installed one of the world's first peel-and-stick photovoltaic (PV) roof systems on a new metal-roofed home near Alamosa, Colorado. Burdick Technologies Unlimited (Lakewood, Colorado) and Eco-Electric (Basalt, Colorado) designed and installed the 3-kilowatt array, which will meet most of the homeowner's power needs. (A diesel generator provides backup.) The system comprises 48 thin-film PV laminates that were adhered directly to the home's Galvalume standing metal roof, associated wiring and electrical boxes, and a Trace AC-DC converter.

The PV laminates, manufactured by Bekaert ECD Solar Systems (Troy, Michigan), are made with a chemical deposition process that layers thin films of PV material on a substrate of stainless steel. The manufacturer boosts the conversion efficiency by using a triple-junction cell — that is, three layers of PV material, each tuned to a different part of the solar spectrum (blue on top; green and yellow in the middle; orange-red and infrared on the bottom). The underside of the laminates is coated with a peel-and-stick adhesive while the top side is encapsulated with UV-stabilized plastics (EVA and DuPont Tefzel).

The PV laminates for this project measure 9 feet, 4 inches long and 15.5 inches wide. Because they are flexible and can be shipped in rolls, all 48 laminates arrived at the site in just two boxes measuring 48 x 48 x 14 inches each.

Note in Figure 2 that the width of the laminates (15.5 inches) is specifically designed so that they fit snugly into standard 24-gauge, 16-inch wide Galvalume roofing pans. Prior to installing the PVs, the pans are thoroughly cleaned with isopropyl alcohol to ensure a good

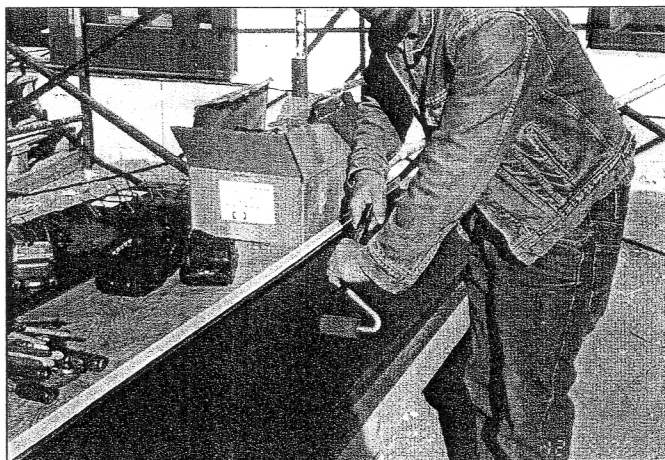


Figure 2 — The PV laminate (Model PVL-64), measuring 9 feet, 4 inches long and 15.5 inches wide, is designed to fit snugly into the 16-inch wide pan of a Galvalume standing metal roof. Once the pans are cleaned, the peel-and-stick backing is removed from the back of the laminates, and they're pressed into place with a roller.

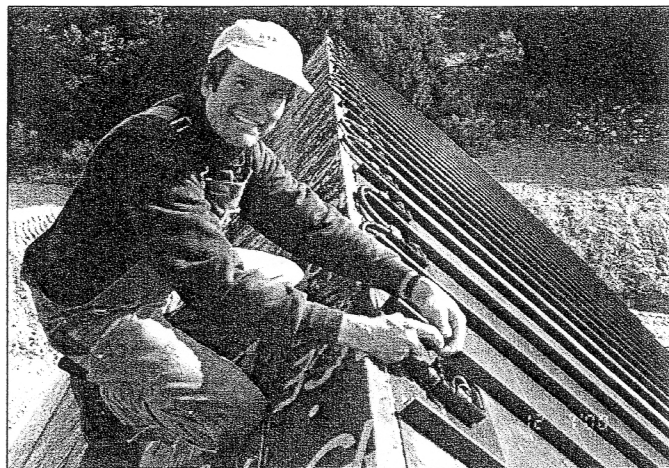


Figure 3 — Electrician Pat Kiernan, head of Eco-Electric (Basalt, Colorado), connects the junction boxes along the top of the PV array.

bond. The peel-and-stick backing on the laminates is then removed, and they are placed inside the pans and rolled down. "This stuff is unbelievably sticky," notes Joe Burdick, president of Burdick Technologies Unlimited. "Once the laminate is set into the pan and rolled, it's not going *anywhere*."

Apart from the PVs, the standing metal roof is installed as usual, in this case over a plywood deck and an underlayment of 30-pound felt. As shown in Figure 3, each of the 64-watt laminates is equipped with a junction box and a bypass diode for shadow tolerance. The boxes are wired together at the peak of the roof (four in a series to get 48 volts) and then connected down through the roof to the Trace AC-DC inverter. A metal ridge cap protects the boxes from the weather.

"One of the biggest challenges in developing this new PV system was coming up with an adhesive that will bond steel to aluminum, because the metals have different coefficients of expansion," Burdick says. He tells *EDU* that the manufacturer is working on other peel-and-stick adhesives that may soon make it possible to bond the PV laminates to other types of metal roofs.

The 3-kilowatt system costs \$20,000, or about \$6,600 per installed kilowatt. The house it serves is located on conservation land and is a fair distance removed from the nearest utility poles. Burdick says that Bekaert ECD Solar Systems provides a 20-year warranty on the rated power output of the laminates, but their projected life is much longer than that. The laminates were tested and approved under Underwriters Laboratories Standard 1703.

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