



The Orchard Hills School

A Striking Clay Tile Project in Irvine, CA

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In a clay tile roofing debate between traditional twisted-wire ties and innovative polyurethane foam adhesive, the latter won. Construction for the new Orchard Hills K-8 school in Irvine, California, was underway when the decision to use Polyfoam's Polyset® two component tile adhesive to secure the clay tile to the roofing deck saved the district money, accelerated construction, and provided a higher quality product for the district. The school's beautiful, long-lasting tile roof saves energy costs and aesthetically fits into the newly planned community development where boulevards are landscaped, the homes have lush courtyards, and the buildings boast an Italianate Tuscan style.

The school's tile roof has two functional objectives: non-combustible construction and a "cool roofing system." As such, the roofing materials consist of a structural steel deck, R-30 insulation, a gypsum board core fiberglass mat faced panel, an underlayment sheet, and a two-piece terra cotta clay tile. The underlayment sheet protects against water infiltration and provides a bondable surface for the polyurethane foam adhesive that supports the tile. "When we decided to go with the the Polyfoam Polyset® tile adhesive, we ended up changing the type of underlayment. The representatives at Polyfoam provided us with a list of compatible underlayments," says Christopher Bradley, AIA, Project Architect for MVE Institutional of Irvine, California.

For decades, clay tile roofing systems have been attached to the roof decking by twisted-wire ties. Made from galvanized

steel, stainless steel or copper, twisted wire ties are threaded through each hole at the top of each clay tile, and then a series of connected tiles are anchored by strips into the substrate at four to five feet intervals. "This is a very time-consuming and labor-intensive tile attachment system," says Sanjai Ramchandani, California and Pacific Rim Regional Manager for Polyfoam Products. Bradley adds, "One of the biggest problems with the twisted-wire tie system is that the tiles shift in wind gusts; often producing clattering noises. Plus, when maintenance crews go to fix the tiles, they inevitably end up breaking more in the process."

"Once the architects, contractors and owners understood the benefits of the system, it was easy to convince them to change the roofing design to incorporate the innovative Polyfoam Polyset® tile adhesive," says Ramchandani. The polyurethane foam adhesive is applied in beads (or paddies) to the surface of the underlayment and the tiles are set in the adhesive. For the caps of two piece tiles, the foam adhesive is sprayed on the underside of the tile and adhered to the pans. Manufacturers of the innovative adhesive, such as Polyfoam, offer guidelines, training and certification for the construction team to ensure the foam is applied correctly. "There was a bit of a learning curve on this project, but Polyfoam trained our staff, and they came out to help for the first couple days on-site. Afterwards, they came to test the installation," says Joe Aceves, Roofing Contractor of southern California's Applied Roof Engineering.



“Cool roofs” use less energy, cause less pollution, and even provide a more desirable indoor temperature/humidity balance for human comfort. Each layer of the roofing, including the polyurethane foam adhesive, contributes to the high insulation value. The Orchard Hills School’s roof has an estimated insulative value of R-40. In another way to keep the school’s project sustainable, refillable foam dispenser cylinders were used for the foam adhesive application and then shipped back to the manufacturer when empty.

The benefits of using a two component polyurethane foam adhesive over the twisted-wire tie system are compelling. Aside from cutting down labor by approximately seventy percent, the tile foam adhesive sets within a couple hours which allows the roofing crews to safely walk upon the tile to new working areas. “The cushion of the foam adhesive increases the breakage resistance by 80% which greatly helps the crew to install the roof efficiently and safely,” explains Don Rondeau, the On-site Superintendent of general contractor Barnhart of San Diego, “Even if a tile did break, with the Polyset® system, it should remain adhered to the roof and not create further damage.” The foam adhered tile will endure hurricane caused missile events, is effective for seismic zones, and prevents tiles from shifting and breakages caused by even the most severe winds.

Furthermore, with the polyurethane foam adhesive, there are no penetrations made into substrate layers as occurs with the twisted-wire ties that occasionally cause water to infiltrate through the roofing system. If a tile needs to be replaced, the foam is cut with a utility knife, the tile is removed, and another one attached. Many concrete and clay tile roofs installed with Polyset® tile adhesive have withstood hurricane weather in Florida for more than fifteen years and seismic events in Japan and Hawaii.

The Orchard Hills School roofing system is a “cool roof” that exceeds California’s Energy Commission Title 24 energy efficiency standards. According to Energy Star, a “cool roof” can reduce the air conditioning load by up to 15 percent. In southern California, where the cooling season is much more intense than the heating season, the energy efficiency benefits are enormous.

Implementing polyurethane foam adhesive midway through the construction project left the design team with a logistical hurdle that needed quick administrative attention. California’s Division of the State Architect’s Office oversees the design and construction of all public schools. As such, they provide regulations and a list of suggested building materials for state projects such as the Orchard Hills School. Twisted wire-ties were in the base specifications when the project was approved. “After hearing about the polyurethane foam adhesive from Polyfoam’s representative, the team quickly moved to ask for this innovative product as an alternative since it was a DSA approved method,” says Bradley, “the approval process was lengthy, but in the end, the new product was approved and the district received a credit in the sum of \$0.36/sf due to saved labor costs.”

“Clay tile is a product of the earth; it never ages, gets stronger, and never loses its beauty,” concludes Aceves, “it is also an ideal roofing material for areas with high sunshine-exposure because it has a great solar reflectivity that helps to keep the building naturally cool.”

According to the designers and contractors, the biggest weakness with regard to clay tile was indeed the twisted wire tie system because of the labor intensity and the risk of tiles shifting and breaking. Even though it took a team effort for the polyurethane foam adhesive to be implemented on the Orchard Hills School project midway through construction; the district is now proud of their durable, low-maintenance roof characteristic of old world charm and high performance energy savings.



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