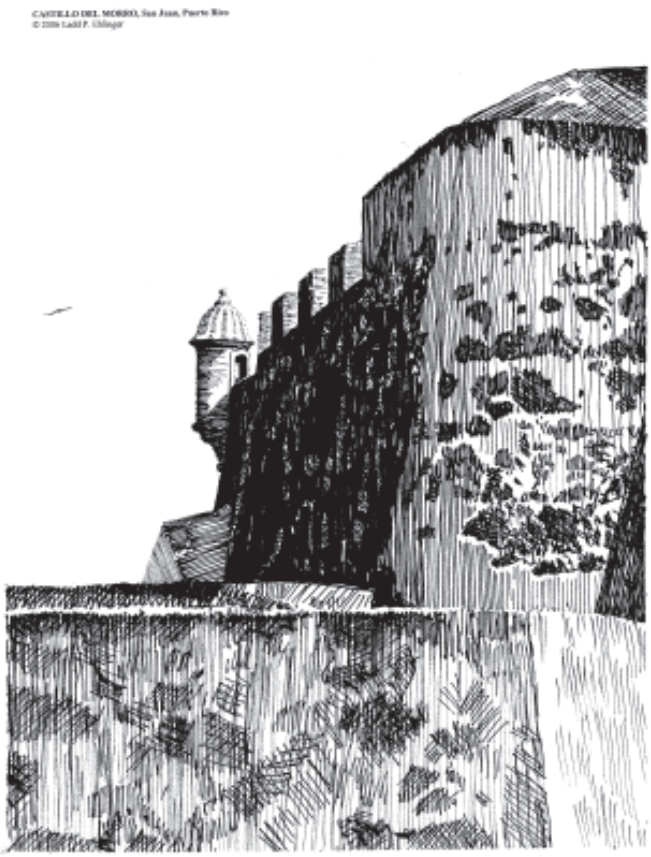
ARCHITECTURE

EHLINGER & ASSOCIATES SECOND QUARTER 2006



CASTILLO DEL MORRO, San Juan, Puerto Rico

This month's limited edition print of a sketch by Ladd P. Ehlinger is of the battlement walls of Castillo del Morro facing the sea in San Juan, Puerto Rico. "Morro" means headland in Spanish, so this fort (castillo) is on the headland at the entrance to the harbor of San Juan, one of the finest natural harbors in the world. A headland is a high promontory of land that acts as the gateway to a harbor. The port of Havana in Cuba also has a "Morro" with a Castillo.

The construction of Castillo del Morro was begun almost immediately by the Spanish upon occupying Puerto Rico in 1515. Numerous engineers and architects worked on this facility as well as the other fort guarding the land side of the city until the Spanish American war, when Puerto Rico was ceded to the United States in 1898. The writer worked on the archeology investigations that were performed by the University of Florida Archeology Department in the summer of 1961, while employed as a Student Assistant Architect in the Historical American Building Survey program of the U. S. National Park Service that manages and conserves the forts. Digs were performed in various areas of the forts and were recorded with sketches and photographs. Numerous arti facts were unearthed that gave much information about the various periods of the fort's occupation and occupants over the centuries.

The walls of the fort are up to 4o feet thick and hundreds of feet high. They are constructed of a stone outer facing that was stuccoed, with rubble infill. The stone blocks were mortared together with a portland cement based mortar. The top surfaces were paved with a plaster that was made from re-fired crushed brick that also functioned like a Portland cement based matrix that is very dense and waterproof. The writer had the privilege of working with the historic drawings and specifications in Spanish.

Low Emission, High-Reflective Foam Insulation Blanket

Move over pink stuff, there's a new insulation in town, and it's taking no prisoners. Commonly referred to as Low-E insulation (though this is a brand name: a standard name for this product hasn't really been adopted by the industry yet), this new insulation product is a reinforced aluminum foil attached on either side of a closed-cell polyethylene foam that varies in thickness from 1/4" to 1/2".

If you remember from our previous newsletters, I've written about closed-cell foaming insulation. Well, the core of this is a similar material, only it has been elasticized and encapsulated by the foil. It's still waterproof, and it's still high in it's base R-Value. Instead of a messy spray-on application, it's extraordinarily easy to cut, to lift and staple into place. It's also relatively inexpensive, ranging from $0.33/s.f. to $0.50/s.f., depending on thickness.

There are two things that makes Low-E insulation special, though: its high reflectivity (97% of radiant heat), and its ability to act as a vapor barrier. So, while a 1/4" thick Low-E blanket is rated as R14.5 (roughly equivalent to a 3.5" thick fiberglass blanket), in actuality it performs much higher. Fiberglass insulation and even sprayed-on foaming insulation, do not reflect radiant heat - they absorb it.

This means that the R-Value of the insulation is put to the test absorbing all of that radiant heat, which is eventually transferred through the insulation. In my attic, for example, where I have a 3" thick cover of sprayed-on closed-cell foam, the R-Value is 30. It takes a long time for the heat of the day to radiate through the insulation, but come 4:00 or 5:00 in the afternoon on a hot summer day, even the insulation begins to feel warm.

The high reflectivity of a Low-E blanket allows the foam core of the blanket to do less work, so less foam is needed to achieve a similar rating. For example, without the reflective sheet, probably 1/2" -3/4" thickness of the foam would be required to achieve the same R14.5 value as the 1/4" thick blanket.

The vapor barrier qualities of the insulation allow it to be used in a wide variety of applications, and in manners that fiberglass, spray-on, and board insulation simply can't be. It can wrap pipes, it can be used as a house wrap over a standard sheathing, it can be installed between studs and rafters in place of fiberglass batt, or even in conjunction with batt insulation. A special version of Low-E insulation is

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coated so that the aluminum won't react with concrete, and it can be used in place of a standard plastic vapor barrier for concrete slab pours. This is particularly effective for slabs with a radiant heating system installed, but would be effective in any area simply to help alleviate the cold-floor feeling that slabs can create during the winter.

In my own house, I'm installing Low-E insulation in the crawl space under the house, and in my enclosed garage addition (didn't do the foam in this part of the house). Under the house, it's been a piece of cake to install. Staple it up to the joists, run some foil tape over the seams, move on to the next portion. I just shoved the original batt insulation that was falling out back into place, and used the Low-E blankets to hold it in place. I would have been absolutely miserable trying to replace that batt insulation; my skin is particularly sensitive to the fiberglass particles - I was already itching for days just pushing the previous stuff out of the way. While I haven't finished under the whole house, I got far enough during the winter to notice the difference between where it was covered and where it wasn't, just by the cold temperature of the floor.

I'm currently adding a bathroom/ laundry room to the back of the enclosed garage addition to my house (which was previously a kitchen). We hadn't sprayed foam on the roof rafters in this area the previous summer, as it was inaccessible. The current work forced us to take out the ceiling in this area, though, so we had access to it, and I went ahead and applied Low-E insulation to it. Our neighbor was so impressed with the difference it made, that he bought enough to install in his attic.

As it's still a relatively new product, I'm still a bit wary of its longevity under exposed conditions - so far, though, I'm incredibly impressed, and do plan on recommending it to clients as an alternative to batt insulation. I'm holding off on recommending using it as a house wrap, or for any important vapor-barrier application until I see how it and the taped seams have held up under my floor after a year or so.

While I wait on that test of time, my next experiment with new products will be insulating paint. Insulating paint is a nanoparticle composite ceramic, derived from the material used in the heat-shield tiles of the space shuttles, that is added to regular paint, and applied just like regular paint. Unfortunately, because of the thinness of paint, a true R-Value can not be applied, but the equivalent value in performance of 2-coats is supposed to be an R-10, with a thermal conductivity of .017 (polyurethane foam is .04, Low-E insulation is .035). So, I'm anxious to try it in the two rooms of my house without insulation in the walls... then I can write about "magic" paint.

R. Perrin Ehlinger

Lessons Learned

In 1976, I designed an 18,000 SF office building for the FAA (Federal Aviation Administration) at Lakefront Airport, New Orleans. The design worked out to be a one story building because of proximity to the runways. Because of the views of the airport and the lake, it was desirous to have as much glass in the building as possible. I worked with PPG (Pittsburgh Plate Glass) on glass selection and chose a bronze tinted reflective glass. This was the latest and greatest high tech super duper product at the time — but was also an experimental product at the time. Remember the gold glass building on the "Dallas" introduction scenes?

The vision panels on the FAA Building were tempered and the opaque panels were heat treated, with an opacifier (a sheet of dense black plastic) applied to the rear surface along with an insulation board and an interior finish surface. The only difference between the heat treated and the tempered is that the tempered is exposed to more intense heat for a longer period of time.

The construction was completed in late spring. With the advent of the first hurricane, we scrambled to assist the Owner to devise removable hurricane shutters to protect the glass. This being successful and after surviving the first storm that year, we relaxed.

Then the fall, and then the winter — one of the coldest we had had in a long time set in. Every time a cold front would pass over, dropping the temperature from a balmy eighty or so degrees down into the high twenties with a clear sunshiny day, one or more glass panels would explode and come out of it's frame in little pieces all over the surrounding porch. Some were vision panels, some were opaque. Before the season was over, almost half the gazing had spontaneously broken. With each glass panel explosion came an explosion of the client also. PPG's local office and the installer had no explanation, and charged for each replacement panel installed.

Then by chance an article appeared in the newspaper about the John Hancock Building in Boston that was experiencing similar problems. I called the expert named in the article, who advised that I get Technical Bulletin 104D from PPG's main office. This manual described the phenomenon of "Spontaneous Breakage" that occurs in heat treated tinted and tinted reflective glass and its root causes. It seems that edge defects caused by defective cuts, such as chips, nicks, 'sharks teeth', etc. produce residual stresses in the glass that are exacerbated by temperature differentials on the surface of the glass. Those portions of the glass that stay in shadow such as: in the glazing pocket, from overhangs, columns in front, the mullions of the frames of the glass, all these areas remain ice cold — while the field of the glass in the sun gets very hot, up to 160° F. The heat is magnified by the tinting and the reflectivity. PPG had never mentioned any of this while we were in the design stage.

The next time a panel exploded, I went to the building with a macro lens on my camera and began photographing the edges of the shards laying around. When queried by the installer, I told him what I was doing and why, and successfully negotiated PPG and the installer to replace all panels at no cost to the Owner. When using this type of glass since then, we require replacement for five seasons at no cost to the Owner.

Ladd P. Ehlinger