

Metal roofing

BY BRIAN PARTYKA

THE COOL FACTS ABOUT ENERGY SAVINGS

WHEN THINKING OF METAL ROOFING, people still may conjure images of old rusty barn roofs. Times drastically have changed with the advent of attractive modern coatings that effectively protect roofing for many decades, as well as provide some remarkable “cool” properties for energy savings.

This energy efficiency can result in significant benefits for all parties involved in a roofing project. For example, the building owner will save money on cooling costs; the architect will be recognized as a contributor to the green-building movement; and the contractor will receive an incentive from the federal government for installing energy-efficient products. These are all possibilities and, in fact, what the future holds when installing a metal roof!

PHOTO COURTESY OF METAL BUILDING MANUFACTURERS ASSOCIATION



Poole Elementary School, Dallas, Ga., utilized infrared-resistant pigments with a total solar reflectance value of 29 percent on its metal roof.



Baggett Elementary School, Dallas, Ga., utilized traditional pigments with a total solar reflectance value of 12 percent on its metal roof.

Understanding Cool Roofing

How can metal roofing be considered cool when the old adage mentions a cat on a hot tin roof? In simple terms, the less radiant heat your roof system absorbs and the more heat it reflects, the cooler it will be.

Cool roofing is measured by two primary standards--total solar reflectance (TSR) and infrared emittance. TSR is a material's ability to reflect, not absorb, the sun's radiant energy into the atmosphere so solar energy never penetrates the building envelope. Emittance is defined as a material's ability to give off heat.

For example, a metal wrench lying in the sun is hot to the touch, but a painted metal tool in the sun is easier to handle. The difference is the unpainted metal wrench has a very low emittance, which means it does not effectively emit heat energy. Instead it retains the heat. In contrast, the painted tool has a high emittance and dissipates the heat energy, allowing you to handle it comfortably. This also is true for a metal roof. When the sun sets, a painted metal roof surface emits a portion of the absorbed solar energy in infrared wavelengths into the night sky instead of transferring heat into an attic cavity. Consequently, the roofing cools fairly quickly.

A painted roof's TSR rating mainly depends on color and type of pigment used. Lighter colors with conventional pigmentation will achieve high TSR ratings; however, recent advancements in pigment technology have allowed the metal construction industry to achieve greater TSR ratings even with darker colors. A metal roof using specially formulated infrared-resistant pigments has considerably higher solar reflectance and infrared emittance without altering the color when compared with conventional pigments used in traditional paint systems. Architects and building owners now have a much wider color range to choose from, including dark grays, greens, deep reds, browns and even black while still achieving "cool" attributes.

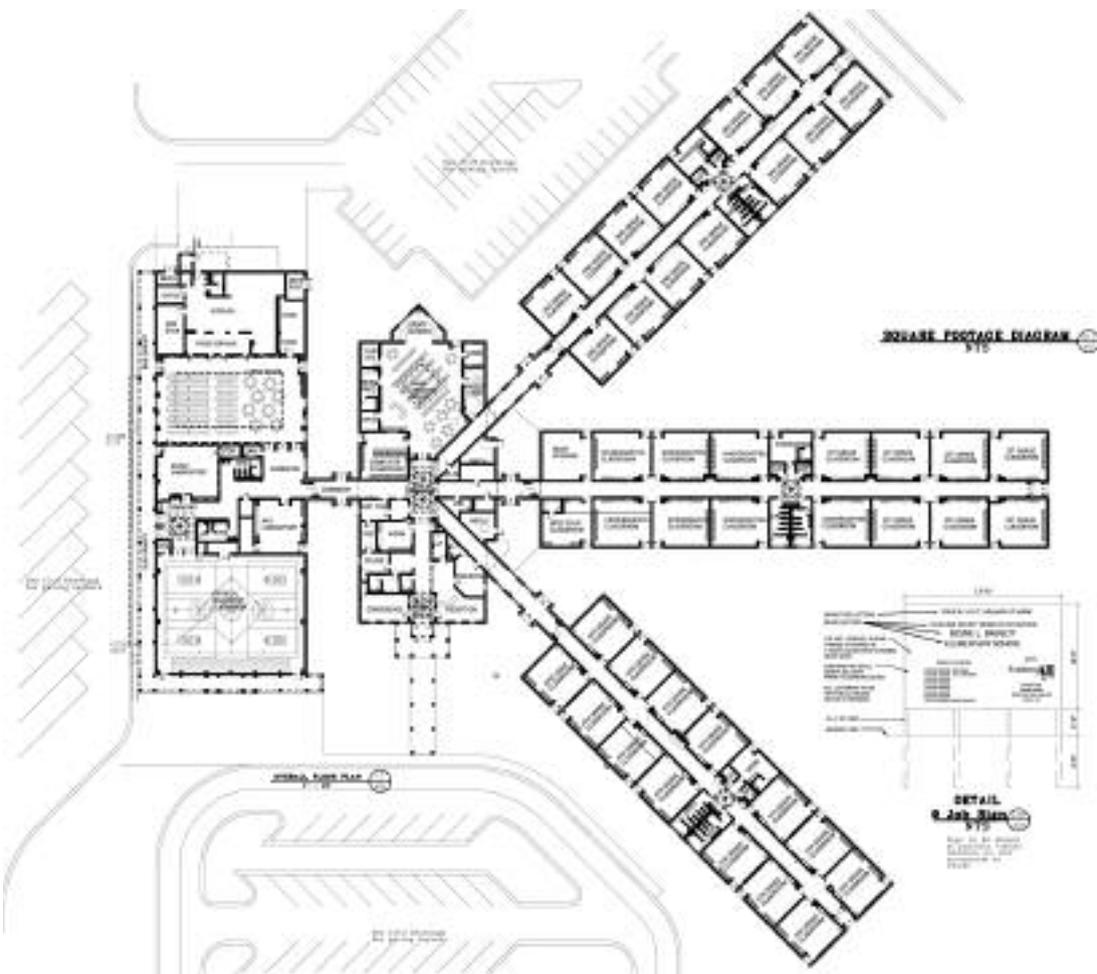
BENEFITS OF METAL ROOFING

Each year, metal roofing consistently is gaining market share in the residential and commercial arenas. Much of this growth has been caused by the fact that the public has become better educated about the benefits of metal roofing. Consider the following metal benefits:

- Durability
- Lower life-cycle costs compared with conventional roofing materials
- Fire resistance
- Wind resistance
- Light weight provides structural savings
- Significant recycled content
- 100 percent recyclability at the end of its useful life
- Energy efficiency

FOR INFORMATION about the benefits of metal roofing, visit www.metalconstruction.org, www.metalroofing.com and www.metalinitiative.com.

FOR MORE INFORMATION CONCERNING COOL METAL ROOFING, visit the Cool Metal Roofing Coalition at www.coolmetalroofing.org. For questions concerning U.S. Green Building Council LEED® credits for the recycled content of metal roofing and its relation to abating the heat-island effect, e-mail Greg Crawford, the Cool Metal Roofing Coalition's executive director, at grcrawford@steel.org.



product on the planet—one that retains its color for more than 20 years and has the ability to save energy. That green product is a painted metal roof utilizing infrared-resistant pigmentation. Building green, or using the right evergreen color in the case of Baggett and Poole elementary schools, is a win-win for everyone involved. 🌱

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Cool Comparison

To further understand the benefits of cool roofing, consider the controlled study of Baggett Elementary School and Poole Elementary School, Dallas, Ga. Both schools are the same size and were designed and constructed exactly the same. They even have the same HVAC equipment, and their thermostats are controlled at the Paulding County School District office. The schools' differences lie in their roof systems. Although each building has an evergreen-color standing-seam metal roof, Baggett Elementary School utilized traditional pigments with a TSR value of 12 percent while Poole Elementary School utilized infrared-resistant pigments with a TSR value of 29 percent.

Poole Elementary School's annual cooling cost net savings is \$8,054 because of an added TSR of 17 percent. This equates to a projected savings of \$282,000 during the school's 35-year expected life cycle. In addition, the added TSR did not jeopardize the school's ability to meet district appearance requirements.

Think Metal

As "green," or sustainable, building practices and the use of energy-efficient products become more prevalent, it seems only natural that a green roof (literally green or not) should be made of the most recycled

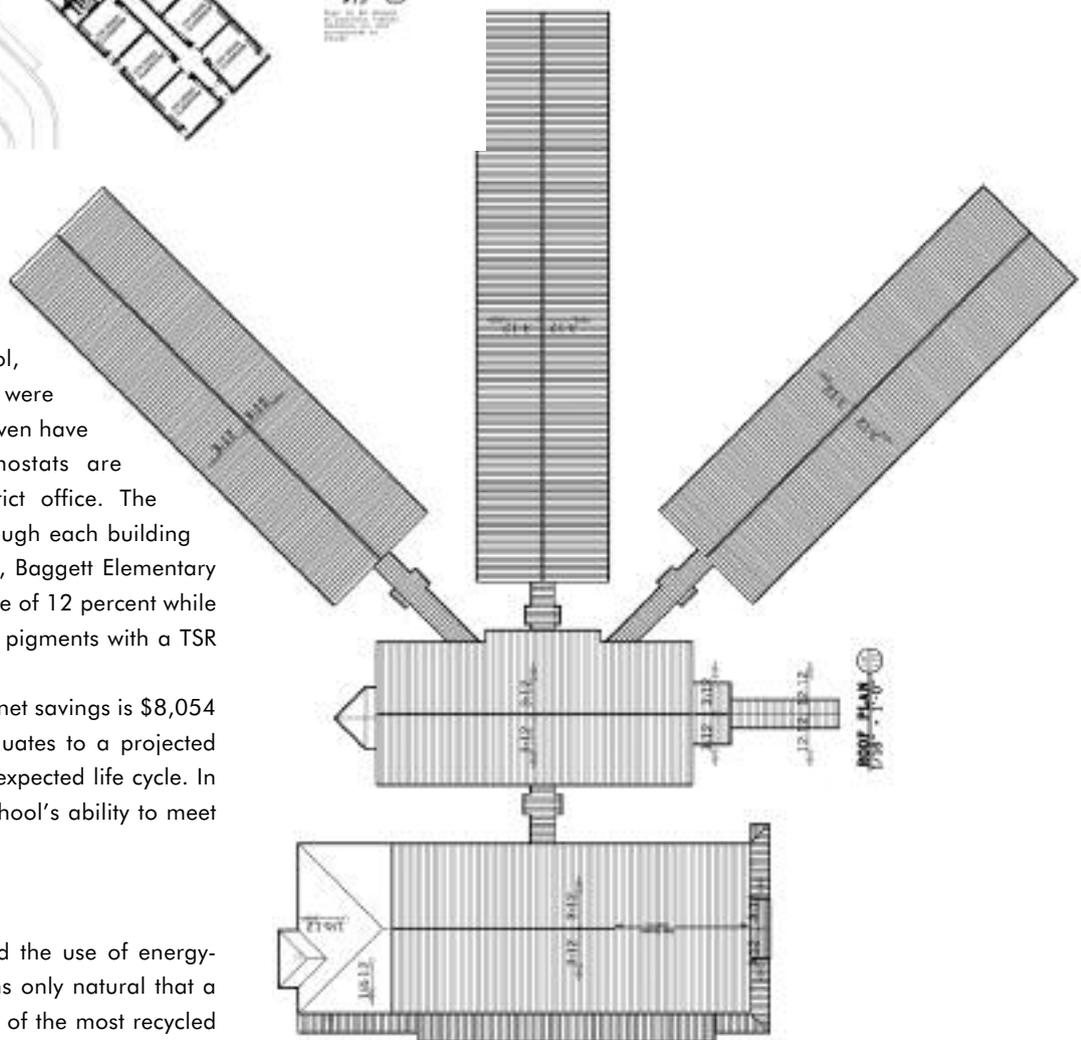




PHOTO COURTESY OF METAL BUILDING MANUFACTURERS ASSOCIATION



PHOTO COURTESY OF PAULDING COUNTY SCHOOL DISTRICT, DALLAS, GA.

PRODUCTS USED ON BAGGETT AND POOLE ELEMENTARY SCHOOLS

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DALLAS, GEORGIA
.....

METAL ROOFS

ARCHITECTURAL METAL SYSTEMS,
Eufaula, Ala., www.ametalsystems.com

COOL COATING

Ultra-Cool™ from BASF,
Florham Park, N.J., www.basf.com

invisible structure 1/2 v

CIRCLE NO. 19



BY KATE GAWLIK

POLICE PRIDE

A POLICE STATION REFLECTS THE ORGANIZATION'S VISION

"THE WOODLAND POLICE DEPARTMENT is progressive, embracing opportunities through effective leadership and individual responsibility; proud of who we are, what we do, and what we can achieve." So reads the vision statement of the Woodland, Calif., Police Department.

A vision statement clarifies an organization's purpose and should motivate action. But rarely do you find an organization that so clearly operates by such a statement. On Feb. 28, 2004, the Woodland Police Department took a progressive step and undoubtedly increased its pride in what it is, what it does and what it can achieve when it moved into its LEED®-certified headquarters.

THE POLICE STATION WAS DESIGNED TO REFLECT ITS RAIL-YARD SURROUNDINGS, SPECIFICALLY THE HISTORIC WOODLAND TRAIN STATION ACROSS THE STREET.



Building a headquarters that would achieve a LEED rating was a top priority for Woodland city officials. City officials also wanted to attain the following:

- Move the 101 Woodland Police Department employees into one facility
- Enhance the department's operational effectiveness and reduce potential liabilities
- Accommodate the police force as it grows to serve the booming Woodland population
- Provide residents with multiuse meeting space
- Reflect the downtown atmosphere
- Create a building with state-of-the-art security features that can withstand heavy, constant use, as well as human and natural threats

According to the U.S. Green Building Council's Web site, www.usgbc.org, The Woodland Police Station is one of three such facilities that have achieved a LEED rating; the 22nd District Police Station in Chicago has a LEED-Silver rating and Cotati Police Facility in Cotati, Calif., is LEED-certified.



DESIGN

The Woodland Police Station is made up of a 2-story 42,845-square-foot (3980-m²) main building. The building houses the lobby and community room, as well as a secured area for police functions, including a holding area, records area, evidence storage and sallyport. The headquarters

also has a 1-story 10,745-square-foot (998-m²) service building, which contains the SWAT/CNT, motorbike patrol, bike patrol, K-9 patrol and a basement shooting range. The site also includes a public parking lot, secured police parking lot and room for future expansion.

The police station sits on a 27-acre (11-hectare) rail yard known as the Gateway Revitalization Area. The city is working to renew this downtown area with renovated or new residential and commercial spaces, office buildings and other civic structures. The police station was designed to reflect its rail-yard surroundings, specifically the historic Woodland train station across the street.

This design requirement was demanding for architectural firm LPA Inc., Roseville, Calif. "Creating an aesthetic that fit the historic context and met budget goals was the biggest challenge," says Paul Breckenridge, senior designer for LPA.

LPA also had to meet many design requirements because of the building's end use—a police station. Breckenridge explains: "Police stations require many specialized spaces that support their work. The [main] building is separated into two distinct sides—public and secured. Security also was an important factor in designing the facility. For example, the first-floor windows at the exterior walls start at 60 inches [1542 mm] above the floor to reduce line-of-sight issues for officer protection against a possible shooter. Other examples include bullet-proof construction at public counters, blast-resistant wall construction at the perimeter of the building, and security cameras throughout the interior and exterior."

CONSTRUCTION

Both buildings are constructed of brick skin in varying terra-cotta shades over concrete tilt-up panels and concrete accents. The concrete, made of recycled content, provides insulation and a bullet-resistant perimeter. A cool roof was installed to reflect sunlight and reduce heat gain. For the same purpose, windows have a reflective, low-E glazing and the building is positioned east-west. The south-facing windows are smaller than other windows in the building to allow less harsh sunlight into the building. To further deflect sun, as well as rain, metal canopies were installed over the south windows and lobby entrance.

Lighting floods the lobby through perimeter clerestory windows. Another major daylighting component is a 2-story glass-walled central atrium that runs the length of the main building and connects to the lobby. Second-floor departments are organized around the 18-foot- (5-m-) wide atrium, and bridges and balconies connect different departments and offices across the atrium. Mostly facing north, the glass atrium allows consistent natural light to filter interior spaces. The atrium also reduces electricity use and exhausts hot air

through louvers along the daylight monitor.

The station's daylight monitor faces north for solar control and to evenly distribute interior daylighting. Sensors monitor daylight in interior spaces and adjust indirect lighting accordingly. Ninety percent of interior spaces receive natural daylight, and 75 percent of occupied spaces have outside views.

"Because of the stressful nature of the work, the quality of the interior spaces was extremely important," Breckenridge says. "Introducing daylight to as many spaces as possible was seen as a way to brighten and enliven spaces, providing a pleasing environment for the officers."

Other green features include low-flow faucets, shower heads and toilets. These components reduce water usage by 30 percent. The buildings' HVAC systems are 10 percent more efficient than required by California's Title 24 energy code. In fact, the police station in all exceeds California's Title 24 energy code by 23.6 percent. (For more information about Title 24, see "empowerments," page 26.)

The HVAC system, as well as refrigerators and drinking fountains, use non-ozone depleting chemicals. IAQ also was addressed by using building materials, furniture, carpets, paints and sealants that meet LEED requirements. Hazardous fumes from copy machines are exhausted through direct vent systems. A roof-mounted intake fan with a humidifier circulates outside air to most of the main building. The shooting range is cooled and ventilated with an evaporative air unit, providing 100 percent outside air. To limit contaminants brought in by officers and visitors, walk-off mats were installed at the building entrances. And only Green Seal-certified cleaning products are used.

The pay off of these and other sustainable aspects is gratifying for LPA. "The greatest reward by far is to hear how the officers enjoy the facility," Breckenridge believes. "To think we may have made their tough jobs just a little easier is wonderful."

DESIGN-BUILD

The Woodland Police Station was the first design-build project in the city. McCarthy



Building Cos., Roseville, Calif., was the design-build contractor. According to Breckenridge, the project serves as a successful example of a foray into uncharted territory. "The design-build process provided a great way to handle the fast-track delivery required. Construction started during the design phase. The foundation and shell were underway while the tenant improvements were being designed and approved."

The design-build relationship also fostered sustainable ideas, which, after all, were central to the project and to creating a headquarters of which Woodland police officers could be proud. "The relationship provided a high level of coordination of the sustainable features. Because the design team was assembled so early, including major subcontractors, ideas for sustainability came out early with accurate costs associated with each. We were able to track and monitor all the LEED requirements on a regular basis—very few items fell through the cracks," Breckenridge adds. 🌱

PROJECT TEAM

▶ **ARCHITECT** / LPA INC., Roseville, Calif., www.lpainc.com

- Steve Kendrick, principal of sustainable services
- Paul Breckenridge, senior designer

▶ **DESIGN-BUILD CONTRACTOR** / MCCARTHY BUILDING COS., Roseville, www.mccarthy.com

▶ **CIVIL ENGINEER** / PSOMAS, Roseville, www.psomas.com

▶ **ELECTRICAL ENGINEER** / REX MOORE ELECTRICAL CONTRACTORS, Sacramento, Calif., www.rexmoore.com

▶ **MECHANICAL ENGINEER** / CAL-AIR INC., Sacramento, www.calair.com

▶ **STRUCTURAL ENGINEER** / CULP & TANNER INC., Chico, Calif., www.culpandtanner.com

▶ **GREEN CONSULTING** / SIMON & ASSOCIATES INC., San Francisco, www.greenbuild.com

- Lynn Simon

MATERIALS AND SOURCES

▶ **GREEN CARPET** / Broadloom and Modular by BIGELOW COMMERCIAL/MOHAWK INDUSTRIES, Calhoun, Ga., www.bigelowcommercial.com

▶ **HIGH-PERFORMANCE GLASS** / Solarban 60 Low-E glass by PPG, Pittsburgh, www.ppg.com

▶ **LOW-VOC PAINT** / Envirokote by FRAZEE, San Diego, www.frazeepaint.com

▶ **ROOFING** / Energy Smart Roof by SARNAFIL, Canton, Mass., www.sarnafilus.com

▶ **LAVATORY FAUCETS** / Optima by SLOAN, Franklin Park, Ill., www.sloanvalve.com

▶ **SHOWER HEADS** / DELTA FAUCET CO., Indianapolis, www.deltafaucet.com

▶ **WATER CLOSET VALVES** / Sensor Operated by SLOAN

▶ **WATERLESS URINALS** / Sonora by WATERLESS CO., Vista, Calif., www.waterless.com

▶ **DAYLIGHTING AND DIMMING CONTROLS (ATRIUM)** / PLC MULTIPOINT, Everett, Wash., www.plcmultiplier.com

▶ **DAYLIGHTING AND DIMMING CONTROLS (OPEN OFFICE)** / WATT STOPPER, Santa Clara, Calif., www.wattstopper.com

▶ **LINEAR PENDANT LIGHTS** / Minuet Series by LEDALITE, Langley, British Columbia, Canada, www.ledalite.com

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