

DESIGNING AND BUILDING A HOME IN THE
MOJAVE DESERT HAD ITS CHALLENGES,
FROM THE 350-DAYS-A-YEAR HOT SUN
TO BLISTERING, BLOWING WIND. THE
SOLUTION? ISO SHIPPING CONTAINERS.

SUSTAINABLE IN THE DESERT

JAMES ASKEW

The project began in early 2009, when the client, Lions Gate movie executive Tim Palen, contacted architect Walter Scott Perry, founding principal of ecotechdesign in Los Angeles. "The client wanted to build something in a remote location, for very little money, and in a short period of time," Perry recalls of their initial meetings. Perry has worked with sustainable design and architecture since the 1970s and often takes a "kit-of-parts" approach to his designs, freely mixing conventional and innovative materials. "Shipping containers," he says, "just seemed like the most cost-effective and expedient way to do it."



To arrive at this conclusion, Perry first worked through each of the project's three major constraints: budget, time and the environment. The building site, a two-and-half-acre lot, sits on a small bluff outside Joshua Tree, CA, overlooking the low mesquite and chaparral brush lands of the Mojave high desert. It is hot and dry and difficult to access, making it a tough place to deliver materials and an even rougher place to work. This led Perry to first consider a standard prefabricated home, something often used in the region, which would go up quick and require the least amount of on-site labor. The only catch was the price. The client set a budget of \$250,000, and as Perry notes, a high-quality prefab in Southern California can run \$250 to \$350 a square foot. Not much home for the money, unless the price could be reduced. Perry's initial estimate for the purchase, fabrication, and install of shipping containers was \$100 a square foot.

The Mojave high-desert environment further lent itself to Perry's shipping container design when he considered the long-term impacts the desert would have on the home. Shipping containers—manufactured, most recently, from Corten steel and sealed with a two-part, marine-grade primer—are one of the most indestructible structures on the planet. The corrosive, salt-laden wind and persistent sun of the open ocean, for all its water, is

remarkably similar to conditions in the desert. As Perry says, "If you framed this thing out of wood, the sun would just eat (it) up." The obvious solution was steel, and shipping containers fit that bill.

Working then off the modern, industrial look of the shipping containers, Perry was able to move onto other elements of the design. One in particular is the client's photo studio. "The owner wanted a box," Perry recalls, a large, light-controlled box to be used for photo shoots. All factors considered, Perry was drawn to a Butler, pre-engineered steel building, with industrial ribbed metal siding. The building, a standard commercial unit, melded well with the aesthetics of the shipping containers, while also conforming to the project's three major constraints. It was low-cost, durable, and could be assembled in a matter of days.

Another key element in the home's design is the custom-built sunshade, which forms the roof and southern façade of living area. Shade in the desert is a vital commodity, and Perry designed that commodity into the home. Between the living area to the west and the studio to the east, Perry left open a 400-square-foot "desert room," with lush greenery and a paving stone and pebbled floor. The sunshade, constructed of repurposed industrial struts and perforated aluminum panels, forms the southern wall and roof



of the desert room and extends out to shade the house. An 8-inch gap separates the sunshade from the building's exterior and, all told, reduces the home's solar exposure by 50%. As an afterthought to the design, Perry might incorporate different panel opacities to achieve varying levels of shading. "On the roof, for example," he says, "you might have 80% shading, (while) on the walls you'd have 50%, because you want to see through the walls."

The builder on the project, Eric Engheben, owner of 44 West Construction in Topanga, CA, first met with the client at an LA home show, where 44 West had a renovated shipping container on display. 44 West began working with containers in 2006 and had since completed four shipping container projects, along with its



WANTING TO KEEP AS MUCH AS POSSIBLE OF THE CONTAINER VISIBLE, THE CONTAINER'S ORIGINAL PLYWOOD FLOORS WERE LEFT INTACT AND SANDED AND SEALED WITH WATER-BASED POLYURETHANE.



ANOTHER KEY ELEMENT IN THE HOME'S DESIGN IS THE CUSTOM-BUILT SUNSHADE, WHICH IS CONSTRUCTED OF REPURPOSED INDUSTRIAL STRUTS AND PERFORATED ALUMINUM PANELS IT FORMS THE SOUTHERN WALL AND ROOF OF THE DESERT ROOM AND EXTENDS OUT TO SHADE THE HOUSE.

Construction on the project began in early 2010, with 44 West purchasing six containers from the docks of Long Beach for \$2,600 each, which it then fabricated into different units: three for the ground-floor living space, two for the second-floor bedroom and bath, and the last as a storage unit off the studio. The exteriors were then painted with a standard, low VOC exterior paint, white to reflect the sun, and custom Milgard windows were installed. To finish the interiors, 44 West uses steel studs encased in a three-part insulation system that creates a R26 wall, with two thermal barriers separating the interior from exterior wall. A layer of spray foam is affixed to the outside wall; the cavities are filled with wool batts; and foam board sheathes the studs. Plywood is then installed and skim-coated for appearance. Plywood, Engheben explains, travels better than sheetrock.

Wanting to keep as much as possible of the container visible, Perry and the client chose to leave exposed the container's original plywood floors, sanding and sealing the plywood with water-based polyurethane. Mahogany plywood, matching the container floors, was then used on the home's circular staircase. The ceilings of the units were also left exposed and insulated from above with R40, slanted foam boards, Densdeck roof boards, a cool-roof TPO membrane, and, over the living quarters, the perforated sunshade.

To Engheben, delivery and setup of the containers was the most dramatic and satisfying part of the project, when in a matter of hours the building site was transformed from an open site of concrete stem walls and piers into a nearly fully finished home. "A lot of people who have come to watch the process say, 'I could never have imagined that what you were building in that facility would end up like this,'" Engheben says. "When you build a two-story home in a facility and everything is on one floor, the containers are 4 feet apart, and when you walk between them it gives you a cavernous feeling, confined. When these are put together and it opens up the space, people are amazed."

In less than a year from the start of construction, the Tim Palen Studio at Shadow Mountain, a 2,300-square-foot, one-bedroom, one-and-a-half-bath home, including a 1,000-square-foot photography studio, was constructed for the finished price of \$150 a square foot, nearly half the cost of a comparable prefab home.

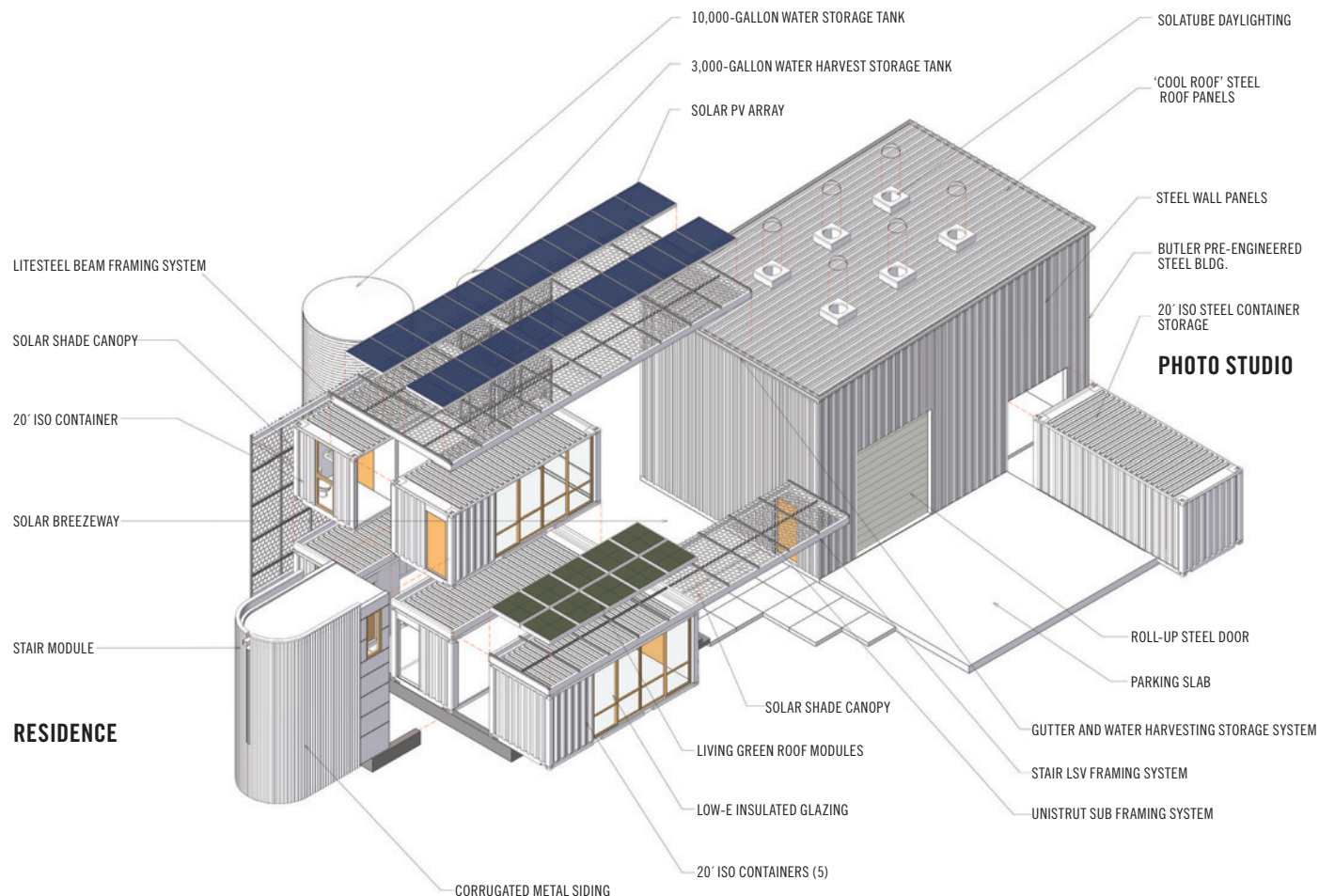
"I always try to clarify affordable housing versus affordable architecture," Engheben says. "What we provide is affordable architecture. The custom homes we build start at \$300 a square foot and go up to as much as \$1,000. We can do these for \$200 a square foot that gives you the same level of detail and quality that you'll

high-end custom homes. The Tim Palen Studio at Shadow Mountain would be the company's fifth and largest container project to date. "We like the opportunity to work with something different," Engheben says. "It is more of a challenge."

44 West works out of a 12,000-square-foot facility in Gardena, CA, where it fabricates the containers into various modular units, fully finished and ready to install. To Perry, this was part of the appeal. "We do everything," Engheben says. "The containers are laid out in the yard, and we do the cutting, the framing, plumbing, electric—everything. We then package them up, protect the windows, take out the sliding doors, and head on down the road. All that is left to do is to secure the units to each other and to the foundation and tie the mechanicals together."

BETWEEN THE LIVING AREA TO THE WEST AND THE STUDIO TO THE EAST, THE ARCHITECT LEFT OPEN A 400-SQUARE-FOOT "DESERT ROOM," WITH LUSH GREENERY AND A PAVING STONE AND PEBBLED FLOOR.





BEHIND THE NUMBERS

PROJECT NAME:

The Tim Palen at Shadow Mountain

PHOTOGRAPHY BY:

Jack Parsons Photography

ARCHITECT:

Ecotechdesign, Walter Scott Perry, AIA

BUILDER:

44 West Construction, Eric Engheben

LOCATION:

The Mojave Desert, Joshua Tree, CA

PROJECT TYPE:

Custom single-family home

PROJECT DESIGN:

Modern; Sustainable

DATE STARTED:

May 2010

DATE COMPLETED:

February 2011

CONSTRUCTION METHODS:

Fabricated shipping containers and a prefabricated steel engineered building

NUMBER OF CONTAINERS USED:

Six

CONTAINER DIMENSIONS:

20 feet long x 8 feet wide, with 8.5-foot ceilings

CONTAINER SIZE:

160 square feet

TOTAL HOUSE SIZE:

2,300 square feet

TOTAL LIVING SPACE:

900 square feet

STEEL BUILDING/STUDIO DIMENSIONS:

36 x 24 feet, with added shipping container

STUDIO SIZE:

1,000 sq. ft.

OUTDOOR, "DESERT LIVING ROOM":

400 sq. ft.

NUMBER OF BEDROOMS:

1

NUMBER OF BATHS:

1.5

LOT SIZE:

2.5 acres

CLIMATE:

High desert, hot and dry

ELEVATION:

2,700 feet

ANNUAL TEMPERATURES:

Low: 34°, high 100°

YEARLY RAINFALL:

4.57 inches, <10 days

ANNUAL SUNSHINE:

350 days

PROJECT SPECS

EXTERIOR CONSTRUCTION:

ISO shipping containers; steel studs; wood studs; Butler, pre-engineered building

EXTERIOR SIDING:

Existing container; corrugated metal siding

INTERIOR SHEATHING:

Plywood, with skim coat

FLOORING:

Living space: Existing container plywood flooring, sanded and sealed with water-based polyurethane
Stairs: Mahogany plywood
Studio: Polished concrete

FOUNDATION:

Living space: Stem walls and piers
Studio: Slab on grade

HVAC:

Forced air, split-unit heat/cooling pump

SUSTAINABLE / GREEN AMENITIES:

Double-plumbed graywater irrigation system
Rainwater harvesting, with 3,000-gallon storage tank
Sol

R-VALUES:

Walls: R26/California code: R19
Ceiling: R40/California code: R30

FINISHED PRICE, PER SQUARE FOOT:

\$150

PRODUCTS AND MATERIALS

ISO SHIPPING CONTAINERS	Purchased directly from docks at Long Beach, CA
PRE-ENGINEERED STEEL BUILDING	Butler Manufacturing
STRUCTURAL, C- CHANNEL, STEEL BEAMS	LiteSteel Beams (LSBS)
STEEL BEAM FASTENERS	Tek screws from Fastenal
SHADE SYSTEM FRAMING, ROOF AND WALLS	Roof: Unistrut metal framing—Walls: Unistrut Telestrut telescoping strut
SHADE PANELS	Aluminum perforated panels from McNichols Co.
ROOF MEMBRANE	Standard TPO (thermoplastic polyolefin) single-ply membrane
ROOF INSULATION	Standard tapered polyiso roof insulation, average R40
SIDING	Standard corrugated steel siding
KITCHEN CABINETS	IKEA modular cabinets
KITCHEN COUNTERTOP AND BACKSPLASH	Italian Carrara marble
ROOF SHEATHING	Georgia Pacific's DensDeck Roof Board
WINDOWS AND DOORS	Milgard custom windows and doors
SUN TUNNELS	Velux Sun Tunnel Skylight, with dimmer
EXTERIOR PAINT	Benjamin Moore Aura Exterior, low VOC
INTERIOR PAINT	Benjamin Moore Eco-Spec, zero VOC

McNICHOLS® Designer Metals

Follow this link to more sunshade examples:
www.mcnichols.com/gallery/application-photos

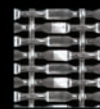


The west wing of the Barnes-Jewish Hospital in St. Peters, MO, is wrapped in bands of **McNICHOLS®** Perforated Metal that act as a sunshade.



Hole Metal Designs

The Hole Story



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