point-of-sale and back-of-house areas, a five-zone digital addressable lighting interface controls system to continuously dim lights in response to available daylighting, occupancy sensors for restroom and office lighting, high-efficiency and instantaneous service hot water systems, outdoor air controlled by a CO_2 sensor combined with an economizer cycle, and a reflective cool roof.

Tubular daylighting devices at a density of 200 ft^2 per device provide daylighting to every space in the store except for the aquatic area in the center of the store. Design simulations predict 20% whole-building energy savings from the tubular daylighting devices and daylighting controls. Additional lighting savings are expected from occupancy sensors in the restrooms, pre-sales area, and offices.

Additional Features

The store also has a wireless energy management system for controlling HVAC and lighting systems as well as for monitoring additional temperature and status points. The ease of installing additional wireless sensors allows for aggressive load management by controlling lighting setpoints, cooling setpoints, and other equipment loads during a peak demand event.

The following how-to tips were implemented in this project: QA8A, QA10, QA16, EN26, DL1, DL3, DL4, DL6, DL7, DL8, EL1, EL2, EL3, EL7, EL10, EL13, EL14, EL15, EL16, EL19, EL21, EL24, EL28, HV14, HV21, HV22, HV23, WH1, WH2, WH4, PL4, and EX4.

PETCO ENERGY SHOWCASE STORE	
Processes for Achieving Energy Savings	**Description of Project Elements**
Envelope	
Opaque Envelope Components	High-reflectance cool roof.
Window Design for Thermal Conditions	Storefront windows provide daylighting to point of sale and vestibule.
Window Design for Daylight	Overhangs on storefront windows.
Lighting	
Daylighting	Tubular daylighting devices provide daylighting to 80% of the building; five lighting zones controlled by digitally addressable lighting interface and photocells and occupancy sensors.
Electric Lighting Design	1.2 W/ft^2 T-8s and metal halide lamps, display and aquarium lighting automatically turned off during unoccupied hours.
HVAC	
Equipment	Five packaged rooftop units with outdoor air controlled by CO_2, integrated economizer cycle.
Service Water Heating	
SWH	60 gal, high-efficiency (94%) gas service hot water, instantaneous gas hot water system for restrooms.
Additional Savings	
Other	Peak demand shedding with wireless energy management system.

CLIMATE ZONE 3—REAL GOODS SOLAR LIVING CENTER

HOPLAND, CALIFORNIA

Real Goods Trading Corporation, a distributor of energy conservation and self-sufficiency products, built the Solar Living Center to be a showroom to mirror its retailing ethic. The 5,470 ft^2 center is located in Hopland, California (climate zone 3), and was completed in April 1996. The showroom at the Real Goods Solar Living Center has incorporated various energy-conserving passive control strategies, such as nighttime ventilation, thermal mass, a well-insulated envelope, stack effect natural ventilation, and passive solar heating. The building is arranged in a curved plan that looks like a sundial with a curved courtyard and stepped roofs where clerestory windows capture the varying hourly and seasonal angles of the sun. Daylighting illuminates the facility through the use of clerestory windows, light shelves, trellises, and manually adjustable awnings. Interior walls are painted white for greatest reflectivity. Fluorescent T-8 lighting at 0.6 W/ft^2 is available but rarely needed.

The building's curved back walls are constructed of 23 in. wide straw bales with 3–4 in. of gun-earth on each side to provide an R-value of 65 as well as a significant thermal mass. The roof is constructed with R-50 continuous insulation (c.i.) above-

Photographs courtesy of Jeff Oldham/Real Goods

Figure 4-7. The landscaping in front of Real Goods Solar Living Center.

(a) **(b)**

Figure 4-8. (a) The entry elevation of Real Goods Solar Living Center makes use of overhangs, a recycled-redwood trellis, and adjustable awnings. (b) The interior reveals its curving, stepped roof, east-facing clerestory windows, and light shelves that deliver natural light deeper into the interior without overheating or glare.