

ENERGY WISE PROJECTS

An Old Idea Made New: It's Daylight and It's Saving Energy and Dollars

The Challenge

MCAS Yuma
Daylighting Project
Bldg 545 Gymnasium

In the American Southwest and Hawaii, energy costs soar with the temperature. Electricity rates are notoriously high, especially at peak hours. What these regions have in abundance is sunshine. It fell to the question of how to harness this abundance and help lower energy costs and usage.

The Solution

A Department of Defense renewable study concluded that the most cost-effective renewable solar technology is daylighting—the use of the light from the sun, combined with complementary electrical lighting systems, to keep work space properly and efficiently lit.

Retrofitting existing office buildings to use daylight can be challenging. In a typical open office, work areas near windows could use daylight, but the overhead lights are usually on the same switch as interior work areas. Even if the perimeter lights are separated onto their own circuit, new dimming ballasts are usually required to avoid abrupt changes in light levels on desks as sunlight levels change during the day. The potential savings often doesn't justify the cost.

But Department of the Navy (DoN) energy managers have found that buildings such as warehouses, hangars, shops and gymnasiums are excellent candidates for daylighting retrofits. With their high ceilings and widely spaced, high-wattage fixtures, new daylighting skylights and daylight sensing controls for the electric lights can be retrofit into existing buildings, and dimming ballasts aren't required.

Marine Corps Base Camp Pendleton has added daylighting to 85 such buildings as part of their integrated program of energy efficiency. They installed daylighting skylights and daylighting controls, and replaced high intensity discharge lighting fixtures with high bay fluorescent fixtures. Modern high performance daylighting skylights are designed to improve lighting distribution and minimize glare as well as heat gain and loss. Daylighting controls turn on all, half or none of the lamps in each multi-lamp fluorescent fixture, a process known as step-dimming. Camp Pendleton has over 1.5 million square feet of building space using daylighting technologies. Electric lights are rarely required during most of the day at Camp Pendleton in buildings with daylighting.



Year Completed	Installation	Annual Energy Savings (MWh)	Annual Cost Avoidance	Description	Funding Source
2002-2008	MCB Camp Pendleton	2,348	\$407,354	Multiple projects, 85 buildings, over 1.5 million square feet. New daylighting skylights, controls, lighting upgrades.	UESC
2005-2007	MCAS Miramar	1,869	\$239,988	5 hangars, 2 gyms, 1 warehouse. New daylighting skylights, controls, and lighting upgrades.	ESPC
2001-2003	MCAS Yuma	1,304	\$104,320	20 buildings: hangars, shops, warehouses and gym. New daylighting skylights, controls.	UESC
2002	NB San Diego	1,201	\$156,168	29 buildings. New daylighting skylights, controls, lighting upgrades.	ESPC
2002	MCB Hawaii	1,084	\$216,877	5 hangars. Lighting upgrades and controls (existing skylights).	ESPC
2007	NB Ventura County	614	\$79,820	15 warehouses. Skylights installed during re-roofing projects.	Local
2005	MCAS Camp Pendleton	343	\$48,020	7 hangars, 2 shops, 1 warehouse. New daylighting skylights, controls, lighting upgrades.	ESPC
2003	MAGTFTC 29 Palms	330	\$59,400	400 daylighting skylights and controls in 14 shops and warehouses.	ESPC
2005	DLA Warehouse San Diego	185	\$24,050	Warehouses. Lighting upgrades and controls (existing skylights).	Local
2005	NSWCCD Philadelphia	100	\$7,300	1 warehouse. Lighting upgrades and controls (existing large windows).	Local
2001	NB Ventura County	51	\$6,668	Demonstration building. Light shelves, lighting upgrades.	Demonstration
2002	NAS Fallon	*	*	426 skylights in 25 facilities, including hangars, warehouses, ordnance shops, gyms, maintenance facilities.	ESPC

* Energy savings combined with lighting project and can not be readily separated

The Funding

The largest of the DoN daylighting projects have been funded by either Utility Energy Savings Contracts (UESC) or Energy Savings Performance Contracts (ESPC). In a few cases, significant daylighting upgrades have been incorporated into related locally funded initiatives such as lighting upgrades and re-roofing projects.

The Bottom Line

Energy Reductions

In the types of facilities chosen for lighting upgrades, electrical savings is generally 50 percent or more and up to 100 percent when sunlight is abundant and no electric lights are required.

At MCB Hawaii, where 80 percent of the lights in upgraded buildings are controlled by daylight sensors, the upgrades have resulted in a 50 percent reduction in energy used by the hangar bay lighting.

At Naval Surface Warfare Center Carderock Division, Philadelphia site, the building-level electric meter has shown a 70 percent reduction in the entire building's electrical use since they installed daylighting controls to take advantage of existing daylight during a lighting upgrade.

Cost Avoidance

Paybacks on UESC and ESPC-funded projects have ranged from 6.5 to 8.5 years using blended average electric rates ranging from \$0.086 to \$0.14/kWh.

UESC and ESPC projects pay for energy efficiency measures that, once implemented, generate cost avoidance that repay the investment over the contract term.

Collateral Benefits

- Superior light quality and light distribution.
- An increase in worker comfort, and as a result, greater worker productivity.
- Lower maintenance costs.
- Less frequent replacement of lighting.
- Reduced electrical consumption during peak hours.
- Eliminated an overheating problem at the gymnasium at Naval Base San Diego (heat gain through skylights was less than heat load from electric lights).
- Daylighting is classified as a renewable thermal technology and can help meet some renewable energy goals.

