

## Case Study

### 117 Union Street Office Building, City of Santa Cruz

Architect: William Bagnell Architects

Services: LEED Consulting, Title 24, Energy Modeling, and Daylight Design



#### Overview

This existing 2-story masonry school building was completely renovated to become 21,000 SF of City Administrative Offices. The project includes large amounts of natural daylight, a photovoltaic array, natural ventilation, optimized mechanical and electrical lighting systems, and improved envelope and glazing systems. The building earned LEED Gold, including all 10 LEED energy credits (LEED-NC, v2.2) and has produced a savings of approximately \$5000 per year on electric energy use and another 30% electrical savings due to the photovoltaic array. This project owner and design team received incentive funding through the Savings by Design Program.

#### Daylight

To provide consistent even daylight over a large floor plate, over 100 suntubes were installed throughout the project, providing daylight for over 80% of the occupied spaces. In an early example of the success of this strategy, we observed during construction that the suntubes alone provided sufficient levels of light for finish painters to work without electric lights. Occasional skylights were used to enhance the connection to the outdoors.



Suntubes were strategically placed on a grid that avoided mechanical lines and fit between the roof top solar panels. Sun angles were calculated to make sure that the PV's and suntubes did not block each other.

#### Energy Savings

EnergyPro v4.403 was used to model the energy performance of this building. EnergyPro is a California Energy Commission (CEC) accepted software program to show compliance with 2005 Title 24 and documentation for PG&E's Energy-Savings-by-Design rebate program. The office building was modeled in the Performance approach method. Including process loads, the Proposed Building performs 35.3% better than the T24 Standard.



#### Envelope Measures

1. Fenestration: South and North facade windows are dual paned, vinyl framed with low-e2 glass.
2. Fenestration: West and East elevation windows are fixed single paned windows with a field applied low-e film.

3. Walls: Additional 3" of spray-applied foam insulation applied to existing CMU walls, other walls are wood framed and insulated w/ R21.
4. Roof: Additional batt insulation and spray-applied deck insulation with Cool Roof top coating will bring the roof up to an R-30.
5. Skylights/sun-tubes: skylights are dual paned with low-e2 glass. Sun-tubes have a comparable U-factor and SHGC.

### Lighting Measures

1. Light fixtures use energy efficient T5 lamps.
2. Stepped ballast with photo-sensors are used in group office areas.
3. Photo-sensors with occupancy sensors are used throughout the building where daylight is available. Over 80% of the building will be daylight.
4. Occupancy sensors used throughout the project.

### Mechanical Measures

1. The heating and cooling system utilizes energy efficient Single Zoned Package Units with Heat Pumps. The HPSF rates range from 8.2 to 8.75. The SEER rates range from SEER 12 to 14.
2. Non-Integrated, economizers are associated with each of the units.
3. DHW is provided with a 74.5 gal natural gas tank with an efficiency of 80%.

### Renewable Energy

A 75 kW system was placed on the roof.

For a standard building, that would have been 35% of energy need, but for the optimized building, that same system meets 82% of the energy need.

