



## 2010 CA Higher Education Sustainability Conference

Energy Efficiency Partnership Program  
Best Practice Awards Application

### Project Category

New Construction: Lighting Design / Retrofit



THE VISION TO CHANGE.  
THE INTEGRITY TO SUSTAIN.

# Cal Poly San Luis Obispo Student Recreation Center Expansion & Remodel



## I. Contact Information

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## II. Project Category

New Construction: Lighting Design / Retrofit

## III. Project / Practice Information

Project Name: Student Recreation Expansion and Remodel  
Project Location: Cal Poly San Luis Obispo  
Architect: Cannon Design  
MEP Engineers: P2S Engineering  
Implementation Cost: \$790,000 (MEPT)  
Estimated annual energy savings (as applicable):  
452,000 kWh total (154,000 kWh Lighting)  
Estimated annual energy cost savings  
\$44,296 (\$0.098 /kWh) electrical savings and  
\$20,790 (\$0.77/therm) gas savings

### III. Project Information (continued)

#### **Description- Provide a detailed narrative describing the project or practice.**

As seen in the submitted renderings, the new building is designed with large areas of floor-to-ceiling glass as well as clerestories to bring in appreciable amounts of natural light. Being a Recreation Center, many of spaces within the building will have uneven occupancy rates throughout the day due to their function. With energy efficiency being very important to the students and user groups, the lighting systems were designed to account for these specific building envelope and occupancy characteristics.

There are seven networked lighting control panels located throughout the building to provide optimal control of the large open spaces that make up a significant portion of the facility. In addition to providing the mandatory building lighting shutoff and afterhours override, the system also utilizes daylight harvesting strategies that incorporate photoelectric sensors into the design of approximately 49,000 square feet of area with daylight contribution. The sensors measure the amount of daylight in each room and reduce the amount of electric light automatically based on the set point. To conserve energy when the rooms are unoccupied, another 10,000 square feet of administrative, lavatory, and storage space is equipped with dual technology occupancy sensors that automatically switch the electric lights off when the absence of people is detected. Energy saving fluorescent 25 Watt T8 lamps are the technology utilized in the indoor environment of the facility.

The outdoor environment is illuminated using full-cutoff pole-mounted luminaires. Lamp technology includes luminaires equipped with Light Emitting Diodes (LED) and energy saving compact fluorescent lamps. All exterior luminaires are controlled via photocell and astronomical time clock.

The renovated building's energy performance is 24.7% better than Title 24 baseline requirements, partially due to savings in the lighting control system and energy efficient building envelope. This provides 5 points under the LEED Energy and Atmosphere category, Credit 1. The expansion and renovation project meets the LEED V2.2 Silver certification requirements. Over \$200,000 in energy efficiency incentive money is being awarded to Cal Poly San Luis Obispo thru the CSU Partnership program from PG&E.

#### **Relevancy to the Best Practices program- Describe the features of the project/practice that qualify it as a best practice of potential interest to other campuses (eg. replicability).**

The fixtures chosen to illuminate the hi-bay areas are equipped with fluorescent T5HO lamps as opposed to the more traditional pulse-start metal halide. The fluorescent lamps offer several clear advantages for hi-bay applications. Among these advantages are the 40% longer mean lamp life which reduces maintenance costs, as well as its ability to be dimmed down to 10-20% (a feature not available to metal halide fixtures). The Recreation Center addition contains 28,000 square feet of hi-bay space (illuminated by over 26,000 Watts of T5HO fixtures) resulting in significant cost savings due to lamp dimming and lower maintenance. Due to the required warm-up time of metal halide lamps, other control features such as bi-level switching and automatic shutoff favor the T5HO as well.

The majority of the remaining interior spaces of the facility are illuminated with fluorescent 25 Watt T8 lamps. The abundance of natural light in the building - along with utilizing advancements in optic technology (such as volumetric lighting) - created the opportunity to apply the lower wattage lamp resulting in a 20% energy usage reduction when compared to standard 32 Watt T8 lamps.

The LED fixtures chosen for the exterior also represent significant cost savings due to decreased energy and maintenance. The installation of the LED fixtures results in a 40% decrease in energy consumption over comparable high intensity discharge (HID) fixtures. Along with the energy savings, another advantage inherent to the LED fixture is lower maintenance costs due to its mean lamp life which in most cases is double the duration of comparable HID fixtures.

**Design integration- If appropriate, describe the ways in which this project/practice incorporated multiple disciplines and/or stakeholders into the design process. Describe how collaboration produced sustainable solutions or improved the project's performance.**

In order to be awarded the design of the project, the design team was interviewed by user groups from Cal Poly Recreation Departments, Facilities, and most importantly by the Cal Poly student government representing the students. At the time of the interview, the one of the largest areas of concern was "Green Design" implementation, a high priority of the students.

P2S Engineering and Cannon Design worked closely together to ensure the envelope of the new building and the renovation of the existing building helped minimize the requirements of the lighting distribution system. Solarban 60 Low E glass was used for the windows and placed appropriately to increase the amount of natural light in the building while keeping the internal heat gain and subsequent cooling requirements at a manageable level for the indirect/direct evaporative cooling system. Also, the lighting control system serving the existing portion of the facility was replaced with the campus standard compliant control system. This will assist Cal Poly maintenance engineers to maintain, monitor, and control the lighting control system campus-wide.

The students and user groups were heavily involved in design review meetings and review of construction documents from the schematic design phase through the final construction documents. The CSU Mechanical Systems Reviewer (MSR) and the commissioning agent were also involved throughout each phase of design. Since it will be a LEED Silver certified building, the commissioning agent worked hand-in-hand with P2S Engineering to ensure the desired energy efficient design approach is implemented into the lighting control strategy. This ensures that the system will operate efficiently and can be commissioned once construction is completed.

Currently, a Cal Poly San Luis Obispo senior level architectural class and ASHRAE student club are assisting with the LEED documentation completion and assisting the commissioning agent respectively. Our LEED consultant is assisting with directing the senior architectural group with all the components of LEED as related to this project. Their first task is to develop a program or framework to connect student design teams and volunteers with the LEED process on both new construction and existing buildings. With this, they will determine how the student design team can be of assistance. Individual students or student teams will work with consultants and contractors as either volunteers or paid interns, as club or class projects, for academic credit. This is intended to be an ongoing program for any and all future projects on campus. Our commissioning agent will also work with the ASHRAE club to create a commissioning training session for the students, as related to this project. The students will be offered as a resource for our team to use the University's and design team's discretion. Everyone is eager and optimistic to make this relationship work for this and future projects as a benefit to the students.

**Load management- If appropriate, describe how the project/practice provides on-peak electricity demand reduction, or demand response capability.**

In addition to the dimmable fluorescent luminaires previously discussed (which would most likely be dimmed already during a demand response event), the lighting control system is equipped with an interface to allow its scheduling to be controlled by the campus energy management system. Approximately 25,000 square feet of space (equating to over 11,000 Watts) have been identified and designated as zones to be remotely switched during a demand response event.

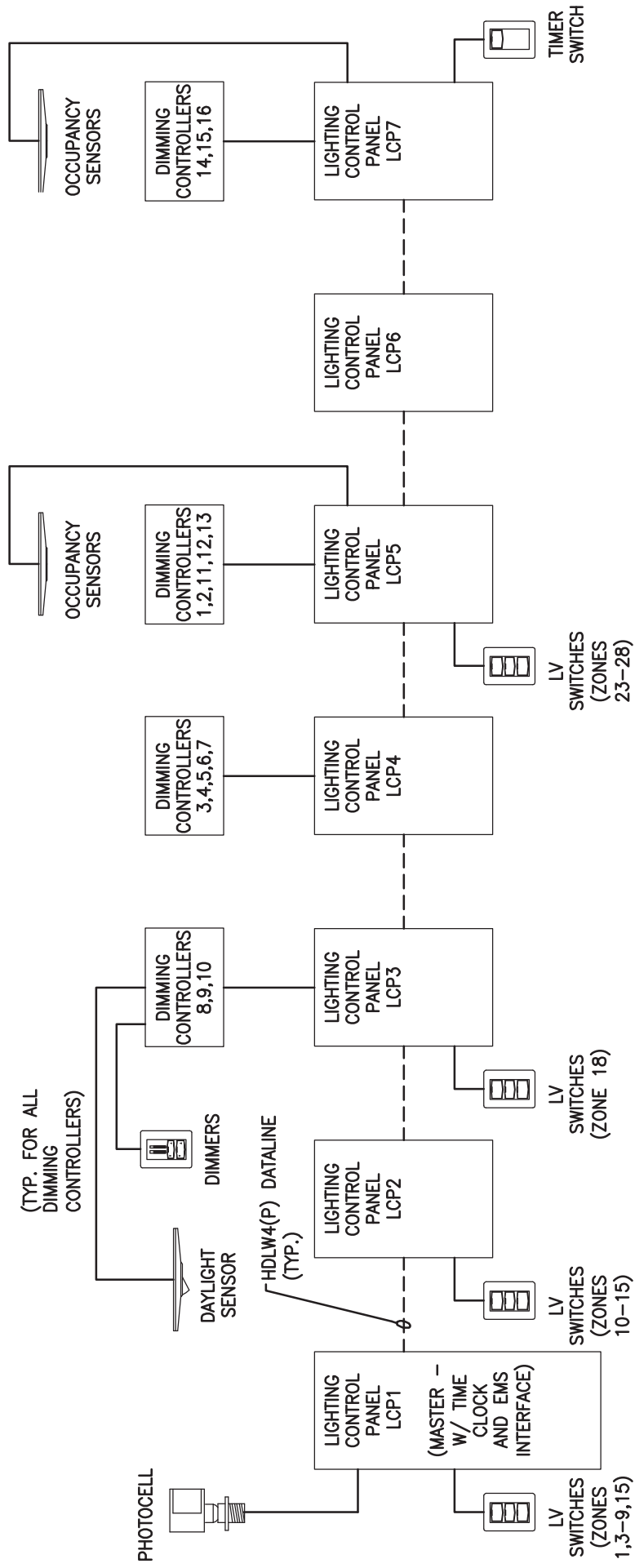
**Best Overall Sustainable Design; HVAC Design; HVAC Retrofit; Lighting Design/ Retrofit; and Water Efficiency/ Site Water Quality, if applicable: Please describe how the project/practice has been received by building occupants. Describe what has been met with satisfaction or dissatisfaction, and why.**

The entire project has been widely received by the Cal Poly user groups, the Facilities, and most importantly, by the students whose own student initiative funded the project and feedback drove the design of the buildings to be environmentally friendly and sustainable. Because of the collaborative efforts between all parties, including the design team and the general contractor, the project design process has been beneficial to all parties.

**Please provide any additional information necessary to assist the selection team in understanding and evaluating the project. Supplemental information in the form of photos, drawings, etc. may be submitted.**

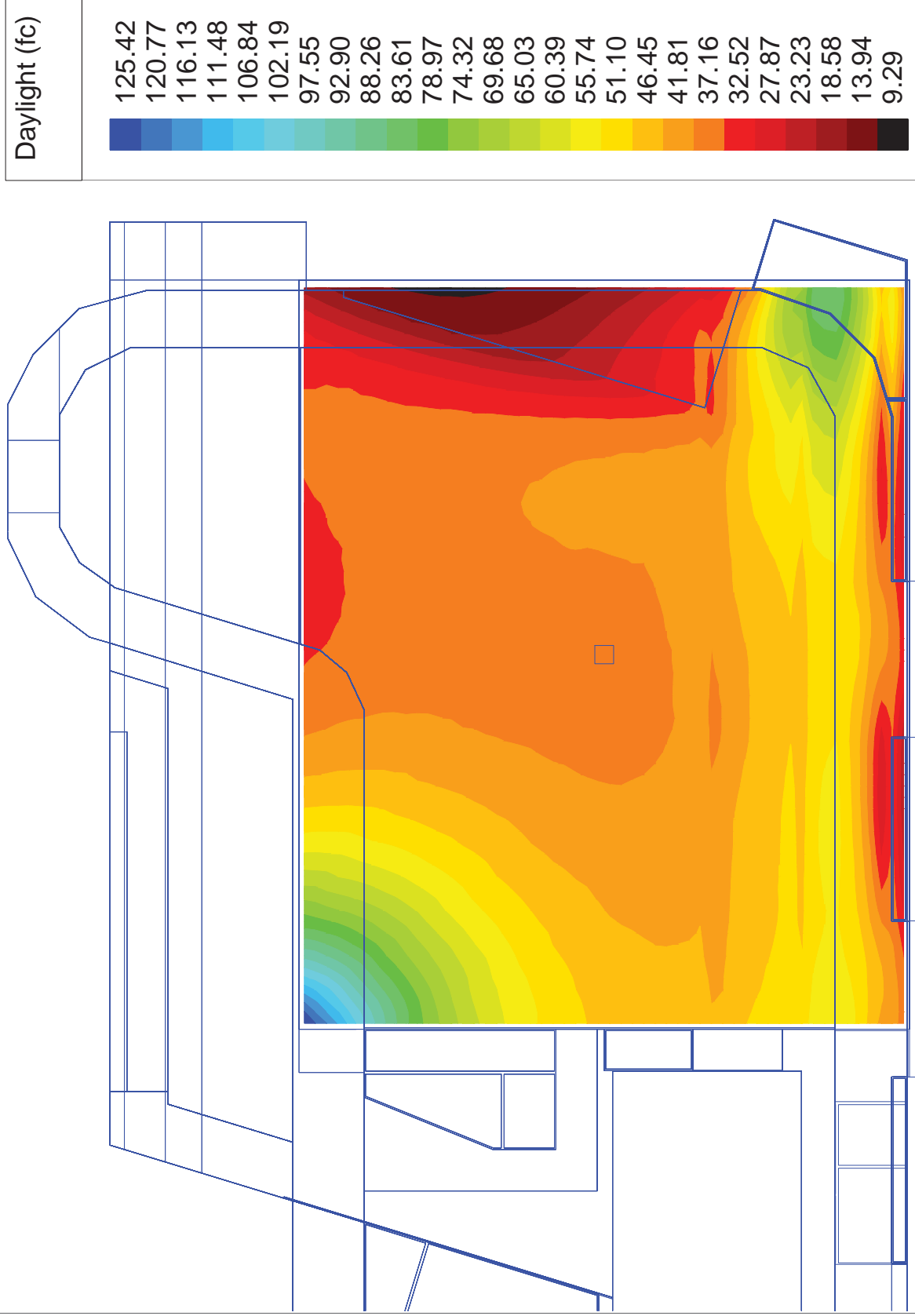
We have submitted building renderings, the lighting control system block diagram and daylight modeling for the two-court gymnasium for reference.

# Project Information



## LIGHTING CONTROL SYSTEM BLOCK DIAGRAM

# Project Information



## TWO-COURT GYMNASIUM DAYLIGHT MODELING