

Sustainability Best Practices for Lighting Design  
Student Rec Center Renovation  
Cal Poly State University, San Luis Obispo

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Presented by

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### Cal Poly at a glance:

- Founded 1901
- Over 300 Buildings
- 5.8M gsf
- 19,000 Students
- 6,200 Residents
- 2,200 Faculty & Staff
- 10,000 acres
- "Learn by doing"



### Student Recreation Center

- Student fee funded
- Completed 1993
- 90,300 gsf
- 5 court gym/event center
- Aerobics/dance room
- Weight training/cardio
- Wrestling/martial arts
- Lap pool
- Racquetball courts
- Sand volleyball courts



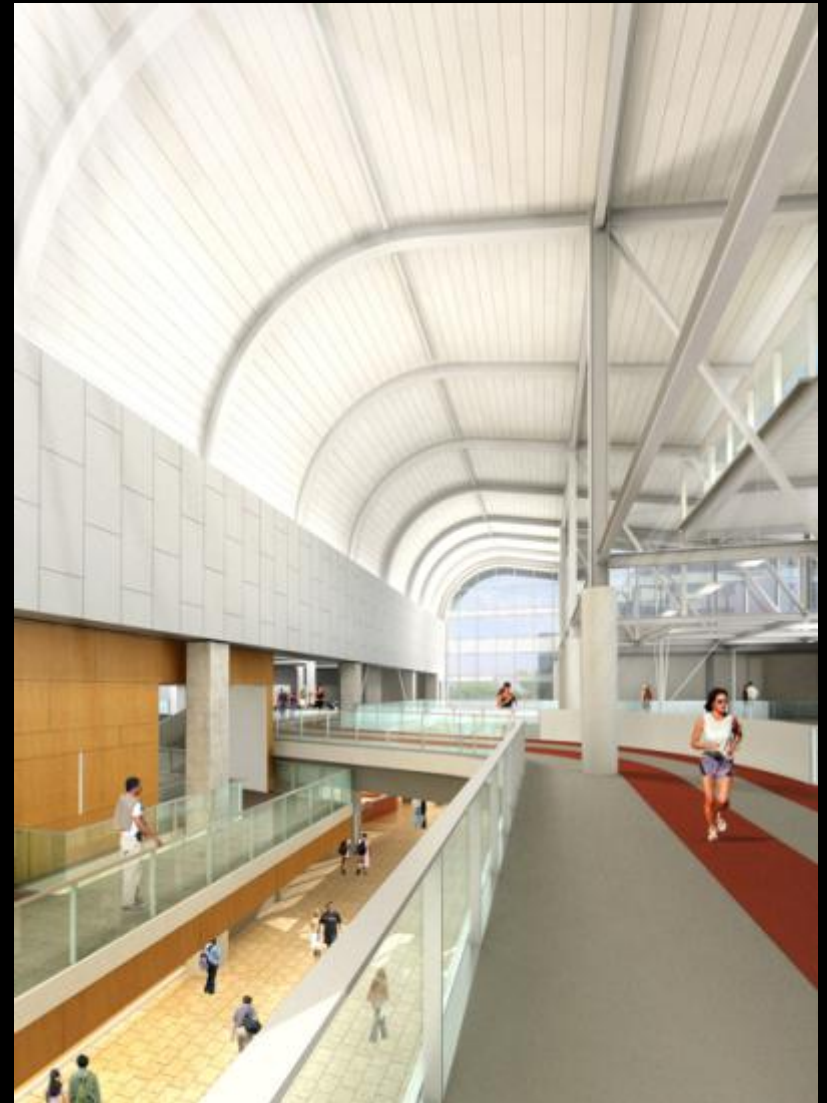
### Rec Center Expansion Project

- Funded by student fee referendum
- New features and spaces:
  - Additional 2 court gymnasium and Multi Activity Center
  - Separate leisure pool and Wellness Center
  - Indoor running track and additional fitness space
- Adding 85,000 sf, \$71M budget, completion Winter 2012
- Architect: Cannon Design Engineer: P2S Contractor: Sundt Cx: Digital Energy



### Project Goals:

- Highly energy efficient – low LPD
- Significantly exceed Title 24
- Achieve LEED Certification
- Evaluate new technologies where appropriate
- Highly controllable and user friendly
  - Daylight harvesting
  - Dimming
  - Occupancy
  - Demand Response
- Interactive design process
- High level of student involvement
- Advance the “campus standard”



### Facilities Input and Campus Standards:

- 25W T8 lamps, 4100K, high CRI
- Wattstopper occupancy sensors and dimming controls
- High efficiency transformers
- T8 or T5 HO in hi-bays – no HID
- Evaluate LED exterior lighting
- Integration with Siemens Apogee - BACnet vs. hardwired
- Metering and SCADA
- LEED Enhanced Metering
- Long life lamps
- Maintenance accessibility



### Student Input and Participation:

- Student Fee referendum and LEED vote
  - 75% voted to fund building expansion
  - 87% voted to require LEED certification!!
  - “LEED the Way” marketing campaign and YouTube video by Green Campus Program
- Students from ASI involved in project programming and goal setting
- Green Campus Internships for academic credit:
  - Architecture students working on LEED docs
  - ASHRAE club students assisting with Cx



### Lighting Design:

#### ➤ Interior

- Direct/Indirect fluorescents in fitness and administrative areas
- Fluorescent hi-bays in gyms and racquetball courts
- Combination of fluorescent linears and downlights in common areas

#### ➤ Exterior

- Pole-mounted LEDs at walkways/sidewalks
- Combination of HID and LED in pool deck areas





### Lighting Design:

- Lighting Control
  - Multi-occupant spaces, common areas and building exterior managed via multiple networked lighting control panels with manual overrides
  - Private offices, restrooms and miscellaneous areas controlled with occupancy sensors and manual switching



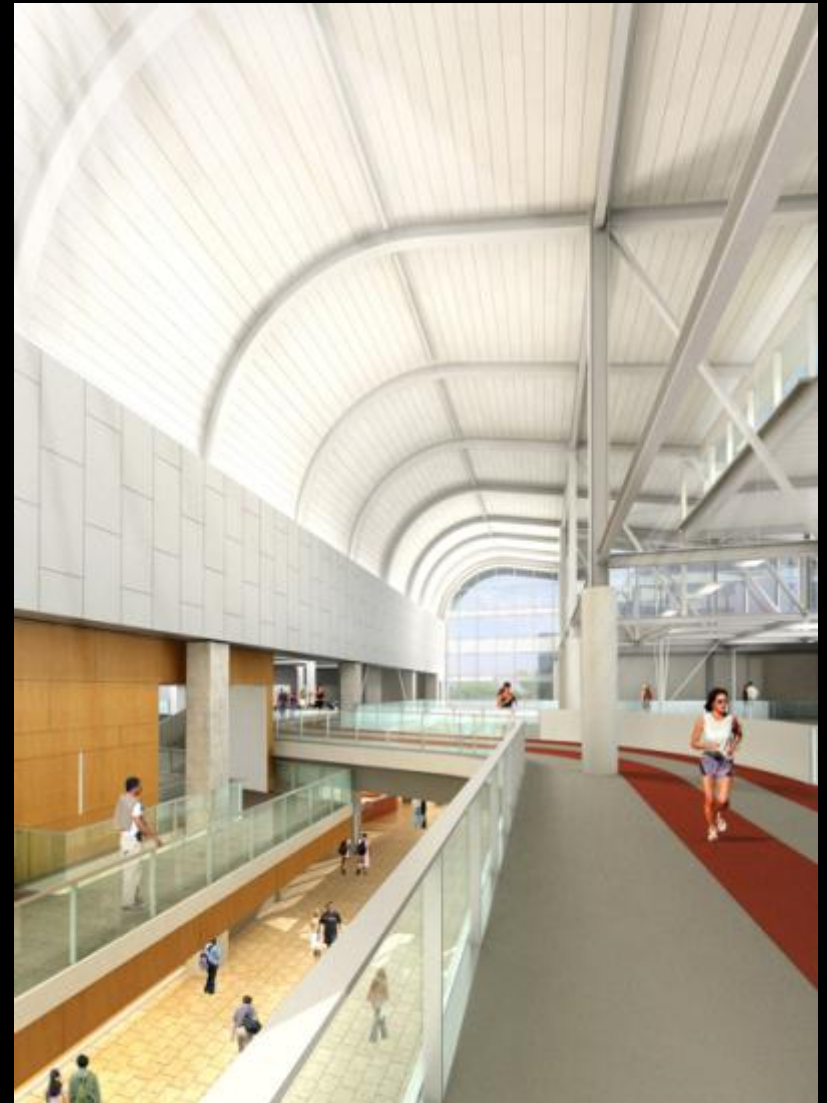
### Sustainable Technologies:

#### ➤ Controls

- Daylight harvesting
- Dimming vs. 'A/B' switching
- Occupancy sensors
- Demand response

#### ➤ Lamps and Luminaires

- Fluorescent hi-bays vs. HID
  - Lumens per Watt
  - Lumen maintenance
  - Lamp life
- Pole-mounted LEDs vs. HID
  - Lumen maintenance
  - Lamp life
- 25 watt T8 lamps



### Expected Performance:

- Hi-bay areas (~28,000 ft<sup>2</sup>)
  - 60fc avg., 0.92 W/ft<sup>2</sup>
  - Min. of 25fc of daylight contribution on 95% of floor area
- Racquetball courts (~5,000 ft<sup>2</sup>)
  - 75fc avg., 2.2 W/ft<sup>2</sup>
  - Comparable installation with HID: 3.2 W/ft<sup>2</sup>



### Expected Performance:

- Fitness areas (~12,000 ft<sup>2</sup>)
  - 35fc avg., 0.75 W/ft<sup>2</sup>
  - Min. of 25fc of daylight contribution on 50% of floor area
- Exterior walkways
  - 26 pole-mounted luminaires
  - 30% reduction in expected life cycle cost vs. comparable HID installation



### Expected Performance:

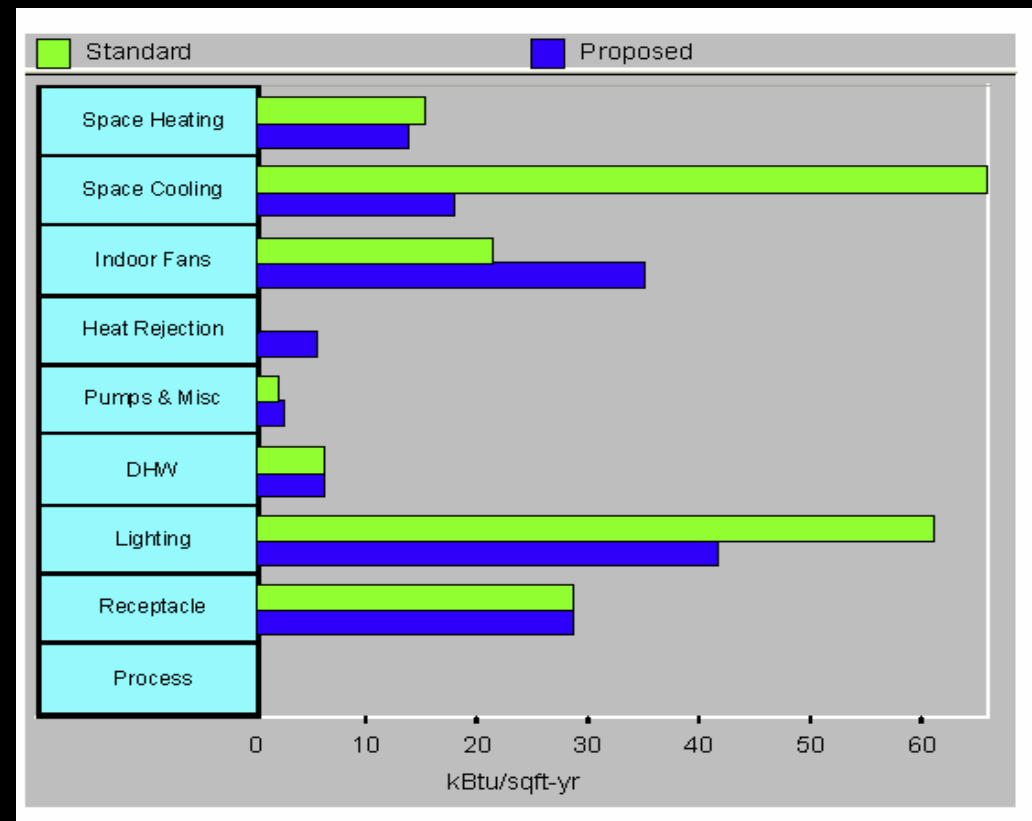
#### ➤ Title 24 calculations

##### ➤ Annual TDV energy use (Performance Method)

- Baseline: 61.07 kBtu/ft<sup>2</sup> - yr
- Design: 41.59 kBtu/ft<sup>2</sup> - yr
- Compliance margin: 19.5%

##### ➤ Lighting power density

- Baseline: 1.042 W/ft<sup>2</sup>
- Design: 0.710 W/ft<sup>2</sup>
- Compliance margin: 31%



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