Higher Education Energy Efficiency Partnership Program

BEST PRACTICES AWARDS

UC / CSU Sustainability Conference, June 2005

A program created by the
UC/CSU/IOU Partnership
under the auspices of the
California Public Utilities Commission

callfornia state university long beach

molecular and life sciences center

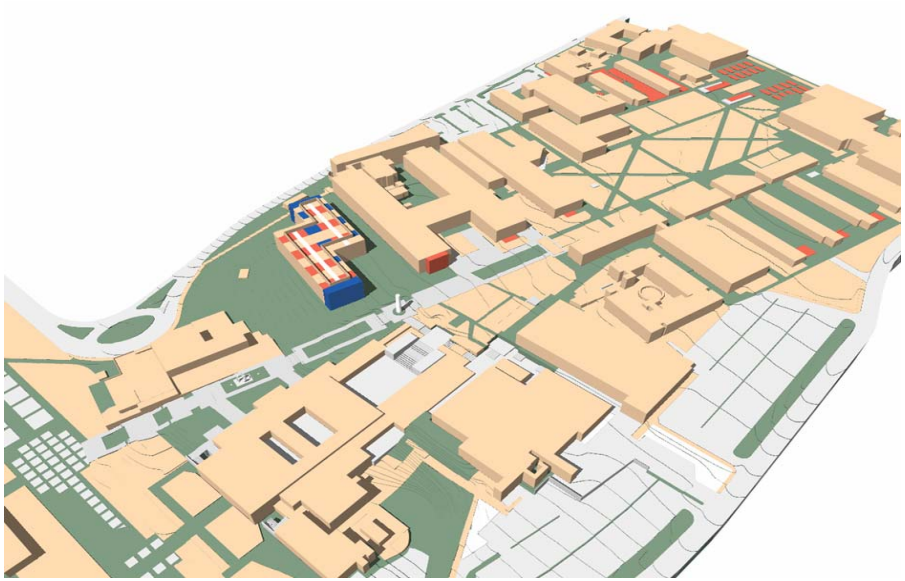
architects/programmers: **ac martin partners**

mechanical engineers: **p2s engineerIng**

lab planners: **ahsc mclellan copenhagen**

structural engineers: **ac martin partners**

Project Timeline



- Design started in 1998
- Construction completed in 2004

CSULB Molecular & Life Sciences Center

- Best Practice Award Categories
  - HVAC Design
  - Innovative Control / Energy Information Systems

aee® The Association of Energy Engineers

Energy Project of the Year, 2005
Southern California Chapter

CSULB Molecular & Life Sciences Center

- 3-story, 95,000 GSF Sciences Center
- Anatomy, Physiology, Biology, Bio-Chemistry and Organic Chemistry research and teaching laboratories
- 114 fume hoods

Early Project Goals

- High standard of safety, health and comfort
- Highly energy efficient
- Effective energy use monitoring & reporting
- Establish a basis for future development

Project Process

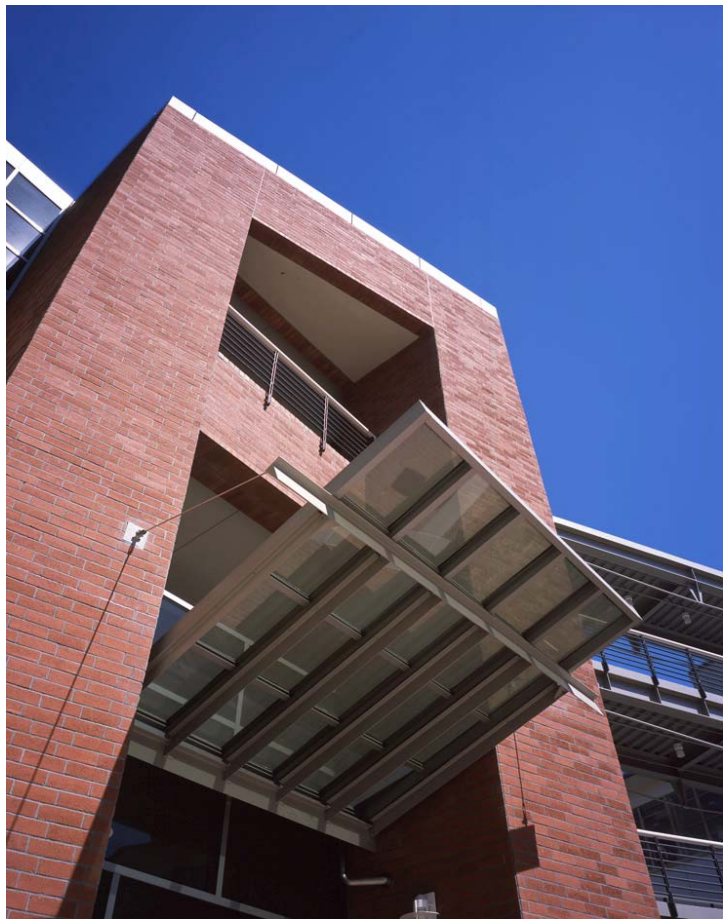
- Whole Building Design Approach
  - Improved energy efficiency
  - Reduced equipment sizes
  - Integrated utility systems

NEW SCIENCE BUILDING

SECOND FLOOR PLAN

Strategy – Reduce Cooling Loads

- Efficient Envelope
  - Exterior window shading on west & east exposures
  - Fritted double-pane glass on south, west & east exposures
- Efficient Lighting System
  - < 1W/SF
  - Direct-indirect lighting
  - Effective use of daylighting
  - Occupancy sensors in non-lab spaces

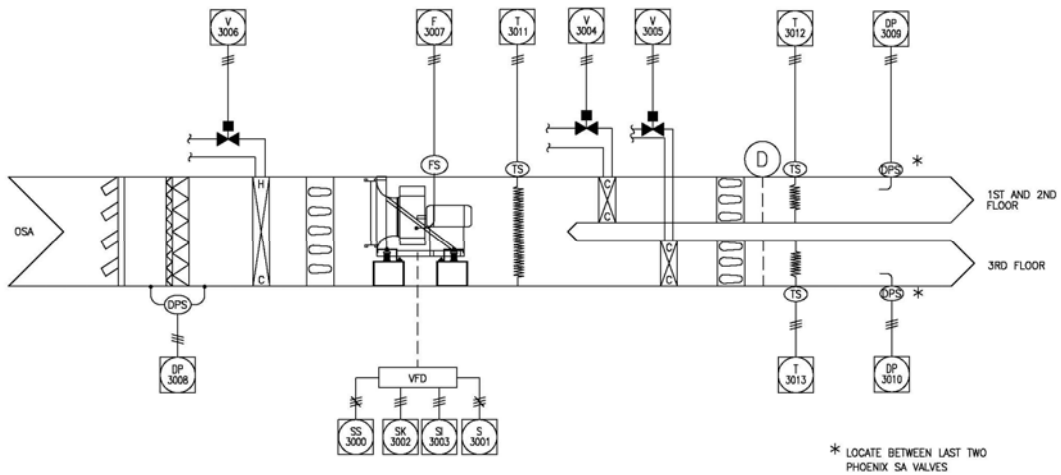


Strategy – Reduce Cooling Loads

- Laboratory Equipment
  - Realistic diversity
  - Exhaust heat
- Occupancy Sensors
  - Reduce when unoccupied
- Cascading Airflow
  - Office → Labs → Exhaust

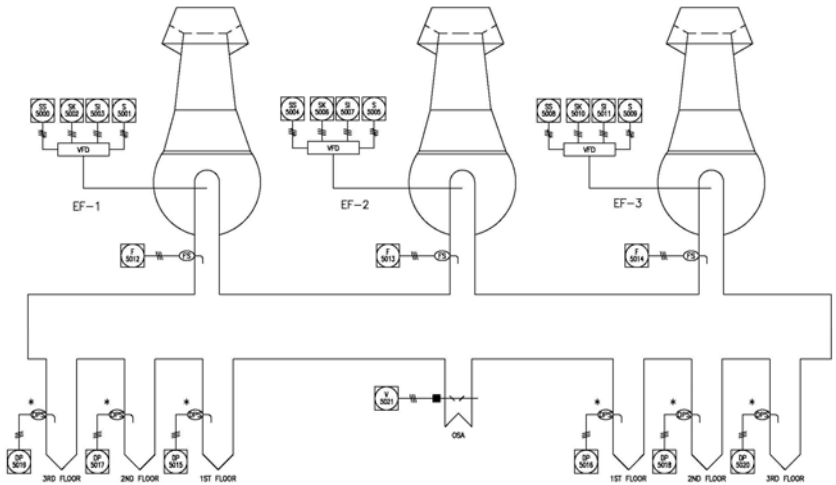
Building Systems Summary

- HVAC Supply Systems
  - Manifolded variable air volume
  - Separate cooling decks for different densities
  - Low pressure drop design
    - Low velocities
    - Simple routing
    - Diversity



Building Systems Summary

- Laboratory Exhaust Systems
  - Mostly manifolded variable air volume
  - N+1 redundancy
  - Low pressure drop design



Building Control System

- Direct digital control for the HVAC, lighting and plumbing systems
- Building trend data and utility metering allows future energy optimization as building needs change

Energy Reduction Best Practices

- Whole Building Design Approach
  - Efficient lighting
  - Efficient building envelope
  - Minimize lab equipment cooling loads
- Fume hood zone presence sensors
- Cascade airflow from non-lab spaces
- Variable air volume control of supply and exhaust
- Minimize over cooling and re-heat loads
- Low pressure drop design
- Reduce minimum air changes when unoccupied
- Increase zone temperature deadband when possible
- HVAC & control system commissioning

Current Status

- Occupied for 10 months with building data and utility consumption trended
- Measurement-based commissioning project
  - Document building energy consumption
  - Optimize building performance
  - Train campus personnel on continuous commissioning practices

Summary of Lessons Learned

- Plan for project success early
  - Set project goals including energy efficiency
  - Involve all stakeholders
- Whole building design approach
- Right-size equipment early to reap benefits
  - Mechanical → Electrical → Building Space → Lower costs
- Building energy & monitoring data can be utilized to continuously improve building energy performance

Summary of Lessons Learned

Things should be made a simple as possible, but no simpler.

– Albert Einstein

Acknowledgements of Team

UC/CSU/IOU Partnership

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ac martin partners, inc.

AHSC McLellan Copenhagen
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