

# California Institute of Technology

## LOCATION

Pasadena, California

## PROJECT DATES

Phase I, Lighting: 08/2011-11/2011

Phase II, Retro-commissioning:  
Ongoing

Phase III, Construction Support  
(Design, Cx, M&V): Ongoing

## PROJECT SIZE

Buildings: 7 | 450,000 sq.ft.

## CONTRACT

Amount:

\$97,000 (Lighting/Controls)

\$112,000 (Retro-commissioning)

\$182,000 (Design, Cx, M&V)

Type: ESPC and Consulting Services

Incentives/Grants: \$23,000

## TEAM

### PROJECT DIRECTORS

Andrew Lynn

Adam Raftery

### ENGINEERS

Jared Haight

Rick Rubalcaba

### COMMISSIONING ENGINEERS

Craig Hawkins

Andrea Marr

Jeff Flogel



## PROJECT OVERVIEW

The California Institute of Technology (Caltech) is a world-renowned science and engineering research and education institution. Caltech began a partnership with McKinstry in 2011 for an energy savings performance contract (ESPC) and since then McKinstry has completed three phases of ESPCs.

McKinstry worked with Caltech to establish baseline energy consumption and conduct a room-by-room audit, including a description of all building systems, for a whole building energy model. To capture immediate savings and explore the possibility of a revolving endowment fund replenished by savings, the first phase was a comprehensive lighting and lighting controls upgrade with savings documented by IPMVP "Option A" process. The second phase included retro-commissioning (RCx) the same buildings plus one to correct no-cost deficiencies and identify measures with longer payback terms. The third phase of work was similar the lighting project and funded through the revolving fund.

McKinstry has developed over \$2,700,000 of scope and are securing an additional \$230,000 in natural gas and electric utility incentives. The aggregate payback from combining the no- and low-cost measures with the more capital-intensive measures is an impressive six years.

## SAVINGS SNAPSHOT



\$13,904



115,867 kWh

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Examples of the no- and low-cost measures that have been identified, quantified, and implemented through the RCx process include:

- Hot deck reset and lockout on dual duct system
- Repairing significant dual duct system leaks
- Re-calibrating pneumatic zone t-stats
- Resetting supply air temperature set-points
- Optimizing static pressure set-points in pneumatic systems and implementing static pressure reset in direct digital control (DDC) systems
- Repairing and replacing broken terminal unit primary air damper actuators and hot water valves
- Removing abandoned in place pre-heat coils from air handling units
- Reducing variable air volume (VAV) box minimums
- Restoring economizer operation and optimizing control sequences

More capital-intensive upgrade projects that are currently being developed include:

- VAV lab fume hood controls to convert constant volume fume hoods to variable volume
- Converting 100% exhaust air zones to return air
- Dual maximum VAV controls for office and other non-critical zones to reduce simultaneous heating and cooling
- Unoccupied set-back controls
- Converting constant flow chilled water loop for process cooling to variable flow
- Converting dual duct constant volume HVAC systems to dual duct VAV systems

McKinstry continues to work with Caltech to evaluate building efficiency and implement energy conservation measures campus-wide under a broad purchase order with the University. McKinstry also completed a detailed assessment on an existing campus building to determine technologies and investment required to become a "Zero Energy" building.