

Standard Operating Procedures *for* Energy Retrofits



Caltech

Facilities Management

Standard Operating Procedures for Energy Retrofits

Overview | Planning & Discovery | Implementation | Closeout |

Overview

Summary

This document is meant to improve our operational efficiency and develop a methodology for sustaining energy-efficient performance at Caltech (CIT). Improving operations is the most important aspect of this project. Contractors are required to maintain focus and diligence in the installation, commissioning, and hand-off of projects to the customer (CIT). Contractors are required to present an operational system that is understandable, well-documented, and capable of being maintained and operated according to the procedures given. CIT may proceed with utility projects either through:

- Design Build
- Primary Contractor
- Engineering Firm
- Primary Contractor and Engineering Firm Partnership

Nomenclature

- Throughout the document, the “Project Team” will refer to all parties working on the relevant projects and buildings, e.g. CIT staff, contractors, and/or commissioning agents.

Each phase requires:

- Documentation (deliverables, schedules, punch lists)
- Project communication

Security rules for primary contractors and subcontractors

- A daily sign-in sheet will be filled out by each person that is working in the building.
 - This will be made available at the request of CIT and maintained by the primary contractor on site.

- The primary contractor will maintain the sign-in sheets and submit them monthly or at the request of Caltech.
- Primary contractors will maintain sheets where most convenient, as long as they are immediately available upon request by CIT.
- Sign-in sheets will be submitted to CIT during project implementation and in the project closeout documents.
- Primary contractors will conduct background checks on all subcontractors and employees.
- Primary contractors and subcontractors will wear badges at all times, with a badge assigned to each person.
 - All badges will be made and managed by the contractor and/or subcontractor.
 - Badges may either be an employee badge with the contractor's logo or a subcontractor's badge with the subcontractor's logo.
 - A list of employees assigned to the project will be kept by the primary contractor.
 - If requested, contractors and subcontractors may also pick up visitor badges from Caltech, which require sign-in and sign-out on a daily basis.
- The Primary contractor is required to read and sign the SOP.
 - The primary contractor is responsible for communicating the applicable portions of the document to employees and subcontractors.
 - The primary contractor is responsible for maintaining relevant parts of the SOP and will assume liability on behalf of subcontractors.
 - Each project will have a security protocol review as part of the kick-off process that will remain the standard for that project.
 - Primary contractor is responsible for communicating work schedules to the Project Team, who will then relay this information to CIT Security upon request.
 - If a security breach occurs, an investigation, incident report, and corrective action plan will be generated by the Primary Contractor or Engineering Firm and submitted to CIT. CIT will follow up if necessary.

Planning & Discovery

1. Process Development
 - a. CIT will identify potential buildings to be surveyed for energy-efficiency upgrades.
 - b. CIT Energy Services will determine the Project Development approach with the Project Team. This can include one or more of the following:
 - i. RCx

- ii. ROM Scope
 - iii. Surveying/Discovery of ECMs
 - c. CIT will provide relevant building drawings and operating information to the contractors assigned to the project.
 - d. Projects will be advanced preferably through design-build or contracted work depending on the complexity of the projects.
- 2. Work Notice Requirements
 - a. Notification of building walk-throughs and audit efforts must be submitted to CIT three (3) business days in advance via the CIT work request form or a similar online database.
 - b. Requests or notifications shall be submitted to CIT only by authorized contractor personnel.
 - i. Exceptions can be made at CIT's discretion. In such an event, the person(s) conducting the walk will be accompanied by CIT personnel.
- 3. Delivery Schedule
 - a. Following preliminary building walk-throughs, the Project Team will establish a target proposal delivery date.
 - b. The Proposal Development delivery schedule:
 - i. Will be updated weekly to ensure efficient resource utilization by the Primary Contractor.
 - ii. Will be sent out weekly to the Project Team, preferably by close of business each Monday.
 - c. The Primary Contractor will review the information provided and can request a detailed audit start date.
 - d. At CIT's discretion, CIT personnel will support the audit effort and facilitate coordinated interviews regarding the current operational issues of the subject building.
 - e. CIT infrastructure work (if applicable) that is in development for the selected buildings will be reviewed by the Project Team to ensure a complete approach and survey is conducted.
- 4. Discovery Documentation – required documentation before implementation begins
 - a. Primary contractor will propose an ECM project portfolio with associated first cost, simple payback (SPB), and multi-year cash flow.
 - i. The stipulated energy savings may be verified by a third-party during a rebate application process with the relevant utility.
 - 1. If a utility-verified analysis is available, this will become the benchmark for the project and the stipulated savings agreement that must be sustained throughout the performance period.
 - b. CIT will receive:
 - i. Projected scope of work

- ii. Energy Savings Estimates
 - c. If the project is not design-build:
 - i. The rough scope of work and rough energy savings estimates will be provided to the mechanical contractor for construction advising and additional energy conservation ideas.
 - ii. ROI is based on the mechanical contractor's prices and will be calculated by the contractor or an engineering firm who has partnered with CIT and the contractor.
 - iii. At CIT's discretion, contractors and contracted engineering firms will be responsible for rebate applications through Pasadena Water and Power.
 - 1. PWP will confirm rebates based on the stipulated savings analysis in the third-party review.
 - d. Members of the Project Team can request a hand-off meeting with the engineering and commissioning firms involved, the Primary Contractor, PWP, CIT, and other relevant third parties to review assumptions and energy modeling information that would help facilitate an efficient review of savings claims.
 - e. CIT will review the project for Caltech Energy Conservation Program (CECIP) financing viability and performance criteria compliance.
 - f. An appropriate level technician will be onsite the entire time during:
 - i. A critical shutdown
 - ii. The replacement or modification of a crucial piece of equipment or components
 - 1. Please note that what is considered critical will be determined on a case-by-case basis during the process development phase.
5. Contractors working on CIT projects will notify CIT staff in writing of:
- i. Defects observed relating to mechanical systems, building controls, lighting, or lighting controls systems
 - ii. Items that are seen during the site visits that are not currently included for upgrade or replacement as an ECM but should be considered
 - iii. Any observed tenant behavior associated with energy waste
6. Final Proposal Submittal
- a. The final proposal submittal will be a combination of multiple scopes and pricing from relevant members of the Project Team.
 - b. A complete ECM project proposal should include:
 - i. A detailed building survey
 - ii. Energy baseline and model information
 - iii. Stipulated savings with SPB, cash-flow, and project break-even analysis
 - iv. Third-party verification
 - c. There are several package delivery styles as follows:

- i. A mechanical proposal based on an RCx report. This proposal includes scope, photos, additional findings, and pricing.
 - ii. A joint proposal package. This package consists of the Primary Contractor providing a complete mechanical proposal that includes an engineering fee proposal.
 - 1. Savings calculations and price should be included in final ROI calculations.
 - 2. Fees for past engineering studies and metering should be included in payback calculations when related to the project.
 - iii. Packages should include an ECM list with consistent numbering.
 - d. CIT authorizes the project for implementation at their discretion.
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Implementation

7. Pre-Implementation Documentation

- a. The Primary Contractor will prepare a submittal package, which will include:
 - i. Applicable mechanical, controls, and electrical drawings
 - ii. Equipment, mechanical components, sequences of operations, schedules
 - iii. Commissioning plan by third-party CxA or self-commissioning (CIT) summary per asset commissioning workflow process
 - 1. Commissioning will be integrated into the planning, design, and implementation of the project.
 - 2. Sequences will be reviewed and approved by Caltech.
 - iv. Key performance indicators (KPIs) for future tracking by Caltech for CECIP payback. KPIs are separate from the Utility M&V Plan.
 - 1. Subcontractors and/or other disciplines submit their offering packages to the Primary Contractor who, in turn, includes it in their master submittal package.
- b. A pre-submittal package will be submitted to CIT for key equipment and components that have long lead times, so these times will not materially affect design concepts.
 - i. The submittal package is presented to CIT for final modifications.

8. Kickoff Meetings and Scheduling

- a. Kickoff meeting occurs with all members of the Project Team and any other discipline involved in ECM implementation within 10 business days following purchase order award.

- b. During the kickoff meeting, the Primary Contractor will present a preliminary schedule to the Project Team for open discussion and final suggestions.
 - c. Following the meeting:
 - i. The Primary Contractor’s Project Manager will submit a finalized project schedule to CIT for approval.
 - ii. The Primary Contractor cannot incur costs until the purchase order is awarded.
- 9. Project Communication – Documentation
 - a. The Primary Contractor’s Project Manager should be prepared to communicate daily with summary details of the day’s work, if requested by CIT staff.
 - b. Any deviation from the project schedule, as well as any issues out of the ordinary, will be reported via email and/or phone call to CIT Energy Services.
 - c. All work requests follow the same rules as during the planning and discovery phase.
 - i. Notification of building walk-throughs and audit efforts must be submitted to CIT three (3) business days in advance via the CIT work request form or a similar online database.
 - ii. Requests or notifications will be submitted to CIT only by authorized contractor personnel.
 - 1. Exceptions can be made at CIT’s discretion. In such an event, the person(s) conducting the walk will be accompanied by CIT personnel.
 - d. An updated implementation project schedule will be sent electronically once finalized, should there be changes in the general project schedule.
 - i. The Primary Contractor’s Project Manager will add any additionally relevant comments/updates to the schedule.
 - e. Schedule change for shutdowns or other work being performed
 - i. Should any issue arise before or during the implementation of an Energy Conservation Measure that will cause a daily in either starting or completing the work, CIT should be contacted immediately to assess the situation.
 - 1. If a CIT representative is not available, the contractor will cease that phase of work until given permission to proceed by CIT staff.
 - ii. Contact list
 - 1. Before work begins, a contact list is required for everyone working on the project.
 - 2. The contact list will be provided by the Primary Contractor for their staff onsite. CIT staff will update the list for CIT personnel.
- 10. Project Detailing
 - a. Field surveys and project detailing will be completed by a technician before replacement of any equipment or equipment components are completed at CIT.

- i. The purpose of the field survey and project detailing will be to verify information related to existing equipment or components of equipment that are to be replaced and/or modified as part of the project
- b. Pan-level measurements should be taken pre- and post-retrofit for all lighting projects
 - i. Subcontractors will gather measurements from a representative sample (10% of the building) to verify savings during the pre- and post-light level readings for the building.

11. Shutdown Scheduling

- a. Prior to shutdown, any directive by a CIT representative that differs from the pre-determined Project Development approach will not be acted on without the express consent of the CIT Project Manager who is overseeing the project.
- b. A CIT Project Manager will be notified in advance of a scheduled shutdown that is determined to be critical per directions in Section 4 (and via the standard work notice requirements procedure). If not critical, notification using only the standard work notice requirements procedure is sufficient.
 - i. If deemed necessary, CIT will organize a meeting with end users to explain the shutdown schedule.
- c. Contact information, including cell phone number, for the CIT project staff will be provided in advance of scheduled work.
- d. Late notice cancellations will be provided at least 48 hours before scheduled event.

12. Status Meetings

- a. Weekly status meetings between CIT and Project Team members will be held unless otherwise discussed.
- b. These weekly construction meetings are not intended to coordinate work with subcontractors. They are for the Primary Contractor’s Project Manager to update CIT on project milestones and to gather feedback for the upcoming week’s work.
- c. Weekly logistics meeting between CIT and Primary Contractor’s Project Manager will be held on Tuesdays, unless noted otherwise. Other contractors and engineering firms will attend during project implementation, as needed.
- d. This time will also be used to review project issues logs and determine estimated completion dates for outstanding issues.

13. Action Items List

- a. A representative from the Primary Contractor will be present at each meeting to take minutes and be responsible to deliver a list of action items to the team within 24 hours for review, comment, and acceptance by CIT.

14. Safety

- a. Contractor safety policies are reviewed with subcontractor personnel during weekly meetings. Confirmation that site safety meetings are occurring is presented in the weekly construction meeting as a weekly agenda item for discussion.

Note: Communication is of the utmost importance. The intent of the Standard Operating Procedures is to ensure that the highest quality project is designed, delivered, and ultimately operated over the long term. Deviation from these procedures will not be accepted unless mutually agreed/discussed. CIT expects to manage the implementation process and will notify contractors if deviations are occurring. CIT will expect priority attention and strict corrective action be taken by the contractor if requested.

Closeout

15. Project Commissioning and Inspection

- a. Commissioning is completed in coordination with the appropriate CIT personnel, documented, and signed off by the CxA and Primary Contractor.
- b. The CxA shall verify completion of all scopes of work and ECM implementation for each discipline.
 - i. Punch list action items will be address, completed, and signed off by Caltech.

16. Project Documentation and Closeout

- a. Required closeout documents to be submitted to CIT:
 - i. Operations & Maintenance Manuals
 - ii. Warranty letters
 - iii. As-Built controls drawings
 1. These drawings and the sequences of operations are to be installed in the mechanical rooms where controls are located or in easily accessible locations for reference.
 - iv. Project Transition to Operations Documents, which include:
 1. An asset list in CIT's format
 2. KPI's
 3. Training
 4. Warranty Information
- b. These documents will be made available for CIT to easily access (hard copy formats should be available upon request).
- c. Copies of each document should be accessible for the building staff.
- d. Operations & Maintenance Manuals should include air handler units and relevant fans, equipment, and other components installed in the building HVAC system.

- e. Closeout documents may be requested by Pasadena Water & Power and should be made available to the utility upon request.
 - f. A transmittal sheet with checklist will be included in the final documentation packet and signed off by the Primary Contractor once complete.
17. Training
- a. Training of CIT personnel on building operations following the implementation of project ECMs will be provided at the completion of the project.
18. Final Summary Meeting
- a. A final summary meeting is held to ensure that the goals have been met and that energy efficiency goals will be maintained.
 - b. Action plans and ongoing O&M to be implemented by CIT are discussed with support from the Project Team.
19. Measurement and Verification
- a. A system performance evaluation by CIT will occur for 12 months, commencing the first month following completion of a phase.
 - b. The performance evaluation will consist of a report generated by ECM in the controls system.
 - i. Warranty work will be addressed as applicable.
20. General
- a. A weekly survey and assessment of completed Energy Efficiency Projects will be conducted by the Project Team.
 - b. These weekly meetings are a run-through of the system.