Integrating Building Commissioning Into State Building Construction

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Overview

Project Goal

- The goal of this project is to improve the realization and persistence of proper operation and resource efficiency in new State buildings, resulting in lower energy use, lower operation and maintenance costs to the State, longer building life and greater worker productivity and user comfort.
Overview

Project Objective

- The overall objective of this project is to establish and implement quality and consistent commissioning services by the DGS during their building planning, design, construction, and operation processes, resulting in lower overall cost of delivering service to the taxpayer.
Overview

Project Objective

This objective will be achieved by collaborating with key staff and management within the DGS to develop procedures, protocols, and specifications for commissioning new State buildings.
Overview

Activities

- Preliminary Assessment of Feasible Options to Provide Commissioning Services to DGS
- Estimate of Statewide Benefits of Integrating Cx into State Building Construction Projects
- Plan to Integrate Commissioning into DGS Capital Outlay Projects
- Pilot the Commissioning Services Implementation Plan Within a New State Building
- Communicate Results to State Agencies and to the General Public
Activities

Preliminary Assessment

- Knowledge, skills, and abilities were assessed and compared positions in the DGS identified
- Preliminary Observation - Four to five new staff required to perform Cx activities
- Three possible approaches
  - In-house commissioning authorities
  - In-house commissioning managers
  - Third-party contractor commissioning authorities
Activities

Estimate of Statewide Benefits

- Four additional BPM staff members manage Cx of 3.3 million square feet
- Annual cost for new staff $600,000
- Benefit to the State would be $2.5 million (based on $0.76 in the first year)
Activities

Plan to Integrate Cx Into DGS

- Process needs to accommodate design-build and design-bid-build.
- Use in-house personnel as much as possible.
- Third-party Cx agents work on complicated buildings and excess work.
- Involve third-party Cx agents with training DGS staff.
- Adhere to team-based structure.
Commissioning Team Structure

Cx Team

- CxA Team
  - PD
  - BPM
  - CxA Lead Role
  - Administration
  - On site

CxA Team

- Owner Representatives
- Occupant Representatives
- Planners
- Designers
- Suppliers
- Prime Contractor
- Sub Contractors
- CSS
- DSS

Green Team
Figure is geared to commissioning framework within the DGS organizational structure, but can be readily generalized to other organizations and settings.

Inner core of commissioning (Cx) team is commissioning authority (CxA) team that oversees and guides the commissioning process.

Outer core of Cx team consists of the professionals, practitioners, and trades people engaged in the planning, design, and construction of a building.
Owner and occupant representatives strongly linked to CxA team in interest of honoring project’s OPR (owners project requirements).

Project Director (PD) has authority over entire project, including commissioning process.

Commissioning team led by a commissioning authority (CxA), which itself is team-based.
Activities

Pilot the Cx Integration Plan

- Caltrans District 3 Building in Marysville
  - 220,832 ft² office building
  - Five stories
  - Water-cooled DX rooftop units (cooling towers)
  - Boilers
  - Heat pumps (auxiliary cooling for electrical rooms)
  - Make up air units
  - CRAC units (data center for No. California)
  - Lighting and daylighting controls
Pilot the Cx Integration Plan

Caltrans - Marysville

Keys to commissioning success

- Building Manager (BM) and Chief Engineer (CE) on site during construction (earlier than usual).
- BM and CE were open to learning about the Cx process and procedures.
- To the extent possible, BM and CE participated in the commissioning process.
  - Coordinated with prime contractor, subcontractors, and CxA
  - Participated in functional testing and reporting
Pilot the Cx Integration Plan

Caltrans - Marysville

Categories of deficiencies

- Access for maintenance denied
- Exhaust air entrained in makeup air
- Missing components
- Incomplete vibration isolation
- Insufficient return air paths
- Difficult access for maintenance
- High-maintenance design features
Access for maintenance denied by placing damper and actuator of VAV box against the wall.
Exhaust air entrained in makeup air by not having tall enough exhaust stacks to move air away from air handler intake.
Caltrans - Marysville

**Missing components** such as condensate pan beneath heat pump.
Caltrans - Marysville

Incomplete vibration isolation where not all piping is attached with isolation fittings.
Caltrans - Marysville

**Insufficient return air paths** remedied by cutting additional openings to return air plenum.
Caltrans - Marysville

Difficult access for maintenance on lighting 57 feet above the floor addressed with hydraulic lift and storage room to park it in.
Caltrans - Marysville

**High-maintenance design features** include a decorative grillwork over the entry that is well suited to be a pigeon roost.
Activities

Communicate Results

- Powerpoint presentation
- Web-based training modules as an introduction to commissioning

› http://solarcities.eu/DGS/DGTEST.swf
Observations

Lessons Transferable to the Cx Industry

- It is essential for the commissioning process to embody upstream quality in a building project to assure quality downstream performance.

- The process of commissioning requires a highly orchestrated team effort driven by all stakeholders, but must be led by a strong alliance between a project director and the O&M crew that will be stewards of the building over its lifecycle.
Observations

Lessons Transferable to the Cx Industry

- Early involvement of the Core Cx team is essential for upstream quality and is worth the investment.
- They are involved on and intermittent basis, time and cost is economical relative to the downstream value achieved.
- Daily interaction between construction team and Core Cx team members is necessary to realize embedded upstream quality.
Observations

Lessons Transferable to the Cx Industry

Education and training are indispensable in achieving and maintaining core competence and quality capital outlay projects.

The need for education may be particularly critical with contractors, who view commissioning primarily as on-site functional testing, and not all the upstream activities that matter more.