Commissioning Design Phase At Columbia University

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Learning Objectives

1. Demonstrate the value of having established University Design Requirements.
2. Amplify the importance of involving the operations staff in the commissioning process beginning at the conceptual / design phase.
Columbia University Overview

- Any given time: 90 projects in some phase of construction.
- $40-70 MM per year of contracted capital projects.
- 7 MM square feet of academic/residential space on the Morningside campus portfolio.
- 121 Buildings in portfolio.
- Full time internal commissioning engineers to facilitate the process.
Design Review Process

• CUCx is alerted to new project. CUCx reviews schematic design, design development, and construction documents.
• At each phase two weeks of review time is allocated for internal review.
• Copies of each design is distributed to each respective shop: M, E, P, FP, FA.
• Design also reviewed by dedicated internal Mechanical and Electrical engineers.
• Comments are aggregated and accumulated and sent back for incorporation in the next phase.
Commissioning Spec

• CU Design Requirements have an outlined commissioning portion followed on all projects.
• Generally do not include this within A/E’s spec book.
• If included, usually copied directly in from CU Design Requirements.
OPR / BOD

• A feasibility study generally outlines the project requirements, acting as the OPR.

• Always should include:
  • Temperature / Humidity requirements
  • Noise Criteria
  • Vibration Criteria
  • Hours of operation
  • Any chemical / hazard exposures
Cx Plan

• Because of the internal nature of the design phase, the Cx Plan is not incorporated at this stage.
• A/E and Bidders are pointed to the CU Design Requirement for commissioning.
• When utilizing a third party, we require the 3rd party agent to develop a Cx Plan for the construction phase, commissioning phase, and turnover phase.
Design Phase Cx Kick Off Meeting

• University Staff (CUCx, Operations, Capital Project Management) attend the design phase meetings with the A/E Team.
• We work in conjunction to provide feedback from an operational standpoint.
• University staff ensure that the design phase milestones incorporate commissioning reviews, and preliminary construction schedules incorporate commissioning activities.
Why involve the operations staff?

- Daily involvement in maintaining the building – know about the problem areas before anyone else does.
- Knowledge of adjacent systems, central plants, loads, capacities.
- Preferences are made known when it comes to tapping off for electrical, or mechanical systems, etc.
- Awareness of impending system shutdowns. Time to prepare and plan.
- Identifying potential internal, non-contracted work to facilitate the project.
Backchecks

- Comments are aggregated in a spreadsheet and responses from the Design Team are expected on each line item.
- Upon each design phase, original comments are back-checked and verified against the new documents to ensure incorporation.
- Any comments that were not picked up are highlighted. Some comments that are no longer relevant, or necessary are also removed.
Page Turns

- If required on large projects, a page turn is conducted with the respective shops, the commissioning team, and the design team.
- Weekly participation from shops at scheduled times ~1 hr a week, as needed.
Why keep it internal?

- Best Practices usually dictate the independent third party CxA to review the design.
- We opt for internal because:
  - Projects don’t always pan out, sometimes die at DD/CD phase prior to construction. Funding a 3rd party to execute this would be difficult from a funding standpoint.
  - Schedule dictates two week turnaround of comments. Procuring / bidding services is difficult in that time frame.
  - Internal institutional knowledge is preferable to fresh eyes reviewing only project documents. – Bigger campus picture.
Why keep it internal?

We opt for internal because:

- Projects run adjacent and simultaneously. They may interact – 3rd party may not be aware of these.
- Intimate understanding of University Design Requirements.
- Efficiency of labor – a complete understanding of the whole building(s) / campus level systems would require more effort than it’s worth.
- Proximity: On campus, immediate field access, logistics.
- Existing Buildings: Nearly all projects on our campus are built within an existing building.
Why keep it internal?

- We opt for internal because:
  - Knowledge of “Big Picture” initiatives that may come down the pipeline, and effect the ‘future’.
CU Design Requirements

- [http://facilities.columbia.edu/design-requirements](http://facilities.columbia.edu/design-requirements)
- Online
- Public
- Comprehensive
- Updated periodically
- Masterspec formatted
Preferred Manufacturers

- Lists manufacturers (and sometimes models) of products that we are comfortable using.
- Keeps Operations staff narrowly focused.
- Keeps components consistent.
- Keeps attic stock at a minimum.
Deviations from CU Design Requirements

- The CU Design Requirements govern most decision points, but there are times when deviation is necessary:
  - Specific laboratories / criteria / tolerances
  - Integration with legacy systems
  - Physical limitations
  - Researcher’s specification / requirements
  - Pilot projects to test certain technologies / vendors.
Internal Design Review Challenges

• Scope creep from Operations.
  • Wishlist development.
• Marrying the engineer’s specs as close to the design requirements as possible.
• Changing technology / manufacturers / vendors / codes.
• Incorporating legacy systems. (BMS / Fire Alarm / Grandfathering)
• Overloading: ~5-10 design reviews in progress at any given time. Operations may not have the bandwidth to participate in reviews.
Transition to Construction

- At construction phase, a 3rd party is usually utilized to execute a design CU is internally comfortable with.
  - Staff Augmentation
  - Competitive Bidding
  - Internal Commissioning
    - Conflicts
    - Minimal project scope
  - 3rd party may execute the final backcheck of design review comments:
    - Increase familiarity with project.
    - Understand the highlights of where we foresaw issues
Transition to Construction (cont.)

• Commissioning Staff now transitions to managing the third party.
• Third party CxA carries project through turnover back to Operations