Design & Consulting Services, Inc.
Building Commissioning
&
Inspection Services
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Project Mgmt. Techniques
&
Commissioning Presentation

Project Management & Commissioning

Overview:

The techniques employed in the commissioning process are based on solid industry project management practices.

It is important that the roles and responsibilities be understood by all parties. This should be outlined in the commissioning specification.

"There is nothing magical or mysterious about how a Cx project is managed."

Break It Down

In order to relate PM and Cx, we need to see how each is defined and what they encompass, respectively.

So, let's look at each…starting with PM.

"Organization is vital to PM and Cx."

What is Project Management ?

- Definition: Project Management encompasses the processes of how a project is planned, executed, scheduled, monitored, budgeted and controlled. The Project Manager is that person responsible for the overseeing of the project management process(es).
- *A project is a unique endeavor undertaking those responsibilities necessary to provide a service or product.*

About The People Who Do Project Management.

Project Management [ideally] requires both an understanding of the industry for which the project focuses and the methodologies necessary to yield a successful job such that it is completed within the scheduled time and budget.

The best-case scenario is one in which a PM possesses the following:

1. Hands-on practical experience as related to the specific industry, and
2. Formal education, as related to construction management, business management, engineering management, etc.

What Experience Is Required To Be An Effective PM?

- Finance and Accounting – Mitigate cost and establish record system.
- Operational Planning – Develop the project Action Plan.
- Supervision – Delegation, team building, work relationships
- Scheduling – Experience with scheduling and tracking.
- Knowledge of the industry.
- Knowledge of the how to execute a contract.
- Knowledge and experience regarding executing changes/deviations in scope, etc.

Tools Of A PM

- Software: Primavera, Microsoft Project, spreadsheet software, word-processing software, email, etc.
- Hardware: Computer, testing equipment, calculators, etc.
- Resources: Personal Library, Company Library, Member of various organizations, peers, other professionals
- Education and Experience.

Structure as Related to PM

Structure and processes are key!

Structure refers to the organization of the Project Management Team

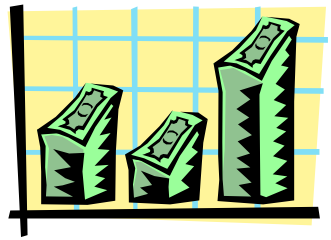
- Who are our team members?
- How is the Team Structured (Org Chart)?

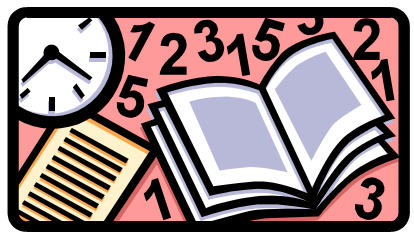
The processes refer to how tasks are executed.

- How is documentation transmitted?
- What is the filing/processing plan for documentation?
- How is documentation distributed and filed?

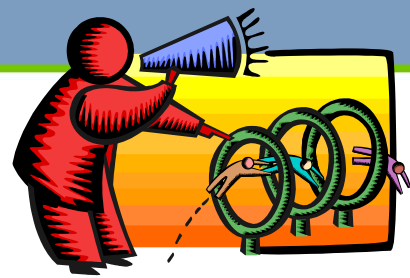
Discussion Of PM Processes

- Scope definition
- Scope planning
- Activity definition
- Resource planning
- Activity Sequencing
- Activity Duration
- Costing Schedule Development
- Budget Project Plan – Combine all of the above. This IS the project package.…FOLLOW IT!!!!!!!!





Discussion Of Problems



A failed job can always be traced back to ineffective management. This is not to say that the management team is incompetent; Management may not have had the proper support staff.

The key is to have competent staff with tried and true infrastructure!!!

Common Project Management Pitfalls

Let's discuss some problem areas:

1. Rush to propose on a job – The result is missed budget.
2. Improper planning and staffing, i.e. not enough resources.
3. Improper staffing, i.e. not the right staff for the job (too v inexperienced).
4. Lack of understanding of what the scope entails.
5. LACK OF INFRASTRUCTURE!

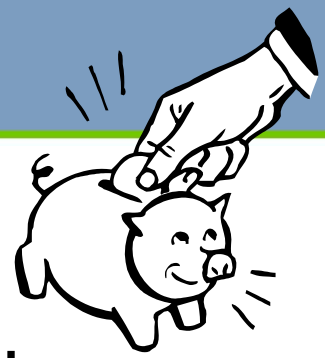
…Can you name some more?

Commissioning (Cx) Defined

The Building Commissioning Association's (BCA's) current definition:

"The basic purpose of building commissioning is to provide documented confirmation that building systems function in compliance with criteria set forth in the Project Documents to satisfy the owner's operational needs. Commissioning of existing systems may require the development of new functional criteria in order to address the owner's current systems performance requirements." This definition is based on the critical understanding that the owner must have some means of verifying that their functional needs are rigorously addressed during design, construction and acceptance."

Savings Resulting From Cx



Some of the financial benefits of commissioning include:

- **Dramatic Reduction of Change Orders (COR's)**
- **Dramatic Reduction of Requests For Information (RFI's)**
- **Proper System Component Selection**
- **Improved Performance**
- **An Operational Facility From "Day One"**
- **Identifying Needs At An Earlier Phase**
- **Working Team From Start To Occupancy**

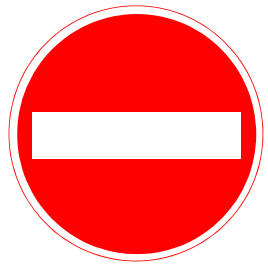
Commissioning Is….

"Commissioning is a process, not an event!!!"

COMMISSIONING IS:

- Adopted by the Owner
- The Owner's Process
- Composed of activities completed by the Owner to verify quality.
- Started at project inception and continues through at least one year of operation
- Integrated into the way an Owner procures their facilities.

Commissioning Is NOT…



COMMISSIONING IS NOT:

- An add-on service
- Activity to be abdicated to the architect, engineer or contractor
- A service that should be delayed in its implementation for a project

When is the best time to begin?

TBCxP offers the greatest value and biggest savings when started EARLY!!!

- Make changes and corrections on paper during planning, programming & design
- Avoid costly rework, callbacks and that unusable building or project

Who Are the Participants?

COMMISSIONING IS A TEAM EFFORT REQUIRING PARTICIPATION BY ALL INTERESTED PARTIES!!!

Participants Include:

The Owner
The Design Professionals
The Contractors
The Manufacturer's Representatives
The Testing Agency, and
A Commissioning Team Leader or Specialist
(Commissioning Agent a.k.a. CxA)

Objectives of Commissioning

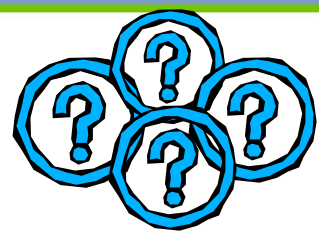
- Establish expected outcomes
- Update or modify building design
- Decide what upgrades and modifications cost-effectively meet the needs
- Measure or predict the basic functional performance of important systems.
- Test building equipment to make sure it works correctly
- Provide building system documentation for future operations and maintenance
- Verify that building and system operators have received appropriate training.

Overview of Commissioning

Commissioning is a systematic process that ensures documented verification that a building system [or systems] performs to the owner's operational needs.

THE PROCESS:

Owner hires Commissioning Agent
Incorporate commissioning into Bid Specifications
Obtain project design intent documentation
Develop commissioning plan
Conduct commissioning scoping meeting
Develop Pre-Functional Checklists
Execute Checklists
Correct Deficiencies
Approve Pre-Functional Checklists and Startup Reports
Develop Functional Tests
Direct and Witness tests
Final Commissioning Report



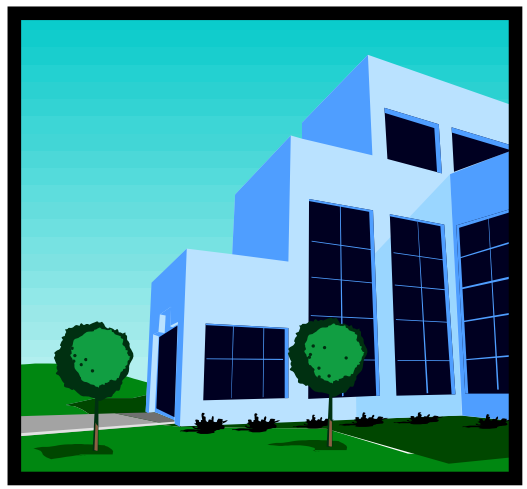
Confusion Regarding Cx

The commissioning process begins at the planning phase of a project and continues into the occupancy phase. However, there are several phases that comprise the “entire” commissioning process. Most individuals equate the Function Testing portion with Commissioning…But, this is only part of the picture.

Primary Phases of the Cx Process

The primary phases which comprise the Total Building Commissioning Process (TBCxP):

1. Planning
2. Design
3. Documentation
4. Construction
5. Training
6. Turnover
7. Post Occupancy
8. Evaluation (Lessons Learned)



Phase 1

Planning

OBJECTIVES:

Document the Owner's Project requirements

Identify and define in detail the client's functional requirements, optimum solution and establish the project budget, completion date, organization including all project team members and any required approvals and processes

Specify criteria for evaluating the project

Develop Design Checklists

Phase 2

Design

OBJECTIVES:

Translate the Owner's requirements into verifiable technical criteria

Prepare detailed instructions for the implementation phase and define implementation strategies

Oversee the development of the functional programming report

Assemble the project team to meet senior management and client/users to discuss and agree upon the objectives

Coordinate with Design Team to discuss statistical areas of concern

Integrate the commissioning activity into the systems design consideration i.e. incorporate the processes into the design specifications

Phase 3

Documentation

OBJECTIVES:

Develop Commissioning Plan, Schedule, Forms, etc.

Review Submittals

Review if substitutions meet Owner's needs

Obtain schedules for overall project, mechanical, electrical and controls

Phase 4

Construction

(Includes Pre-Function & Functional Testing)

OBJECTIVES:

Verify that the end product complies with the established criteria

Move the completed 'project' from the 'static' construction state to the 'dynamic' operating state

Construction Observation, Testing & Balancing, Verification of Systems and Equipment, etc.

CxA to Direct and Witness Testing

Tests to be performed to the extent that the CxA can justify to the Owner that the systems do perform per the design intent

Phase 5

Training

OBJECTIVES:

Extent to be executed as outlined in the specifications

CxA focuses on the Owner's project requirements

Design Team discusses the basis of design

Contractors coordinate training for equipment (large and specialty) as outlined in the specifications. Manufacturers focus on ensuring that training meets the Owner's needs

***

IT IS VITAL THAT TRAINING BE DISCUSSED WELL IN ADVANCE SO THAT TRAINING MEETS THE OWNER'S STAFF NEEDS, AS OPPOSED TO SIMPLY FULFILLING A SPECIFICATION CRITERIA.

…SUCCESS IS BASED UPON HOW WELL THE OWNER'S NEEDS ARE MET.

Phase 6

Turnover

OBJECTIVES:

Verify As-Builts are complete (accurate and legible)
Verify that Record Drawings were turned over to the Owner
Verify Training Records are complete
Verify O&M Manuals are complete
Certificate of Completion issued
Verify that Spare Parts, etc. are transmitted to Owner

Phase 7

Post Occupancy

OBJECTIVES:

Perform any seasonal testing and training

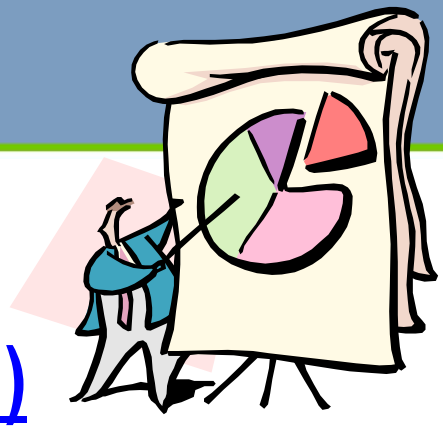
Review equipment performance prior to Warranty Period expiration

Trouble-shooting of problems – Use Commissioning Authority as first point of contact.

Complete and submit Final Commissioning Report

***** Problems identified during construction should not be permitted to be addressed during the Warranty Period. All outstanding functional problems should have been resolved during the Construction Phase!!!**

Phase 8



Evaluation (Lessons Learned)

OBJECTIVES:

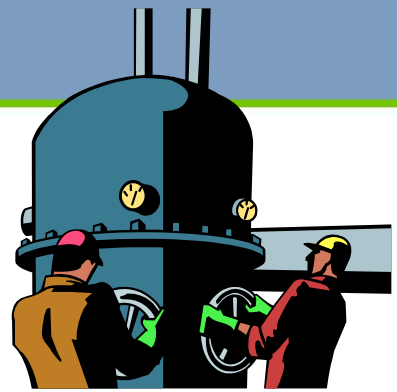
Systematically assess the project against the performance criteria (e.g. vision, pre-occupancy/pre-use evaluation, functional requirements questionnaire)

Verify areas of improvement, I.e. processes, parties, conditions, etc.

Isn't the Owner Already Getting This Service From The Architect and Engineer?

The answer is <u>both</u> yes and no.

All projects are commissioned to some level. Informal commissioning occurs on all projects by default or on an "as needed/as discovered" basis. In other words, the deficiencies are discovered when the building is used. Then, the maintenance staff tries to deal with these problems and systems, or the problem simply never gets fixed.



Recommissioning Explained

Once a building has been commissioned or retrocommissioned, recommissioning may be necessary to verify that the systems and equipment continue to perform as per the original commissioning documents, I.e. in accordance with contract documents and manufacturers' requirements.

Retrocommissioning Explained

The primary goal of retrocommissioning is to optimize the performance of existing building systems with respect to the present usage of the building and the needs of its operating and maintenance staff.

Retrocommissioning is not intended as a means to keep inefficient systems in service. In some cases, analysis may indicate that the optimal course of action is a major renovation.

Questions Session:

This segment is available to entertain questions.

THIS CONCLUDES THIS PRESENTATION.

THANK YOU FOR YOUR PARTICIPATION.

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