



An Overview of Commissioning

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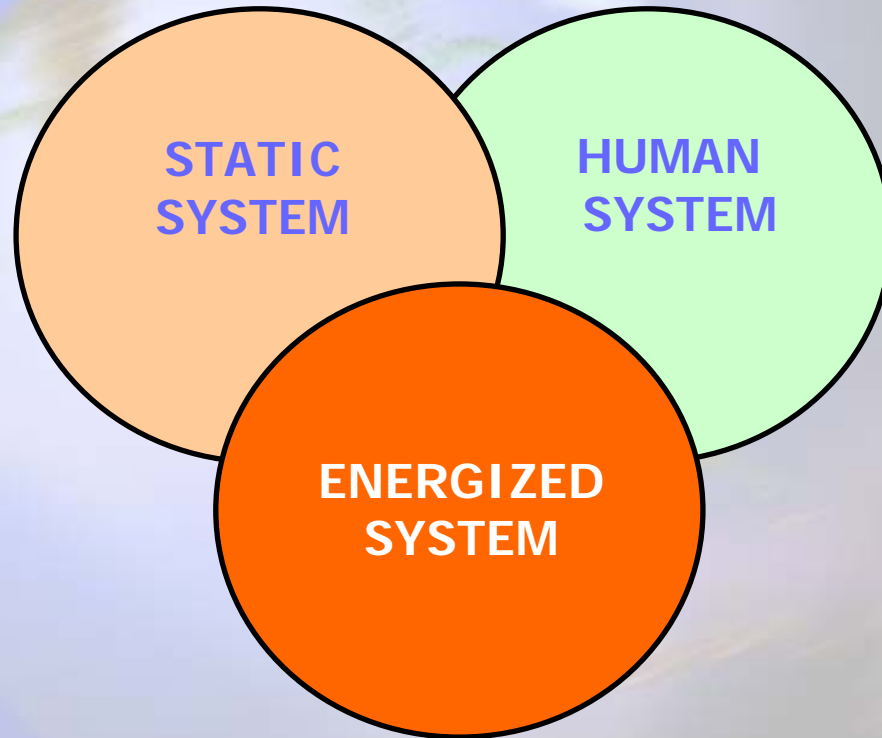
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ASHRAE

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The Three Systems of Buildings

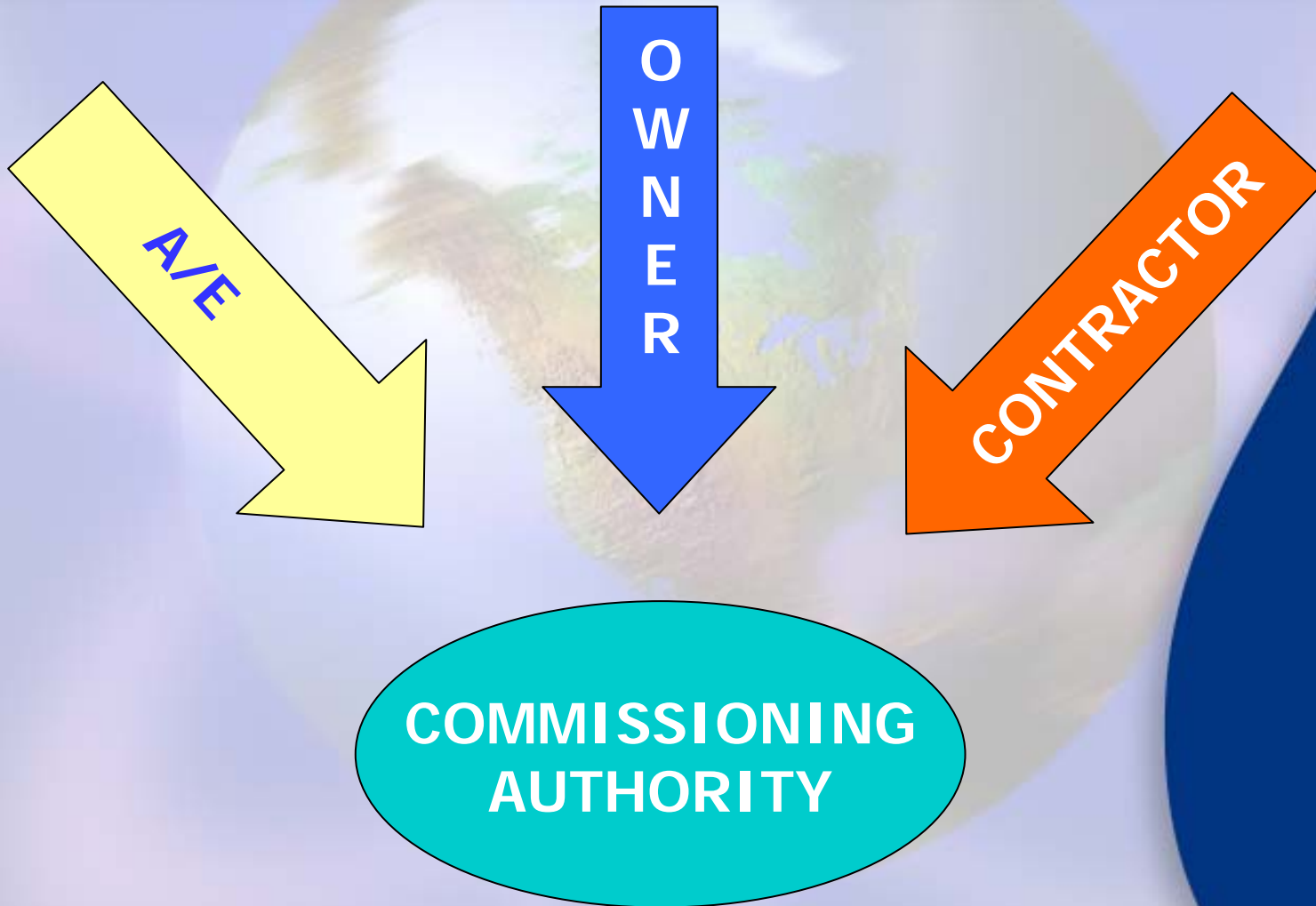


STATIC SYSTEM: (THE FRAME AND ENVELOPE)

ENERGIZED SYSTEM: (THE BUILDING SERVICES)

HUMAN SYSTEM: (THE TENANTS AND OCCUPANTS)

Building Relationships



Role of the Commissioning Authority

- Determine what the owner really wants
- Work with design team to implement a Basis of Design (BOD) Document and Owner's Project Requirements (OPR) document
- Develop a plan to implement the BOD and OPR into the construction documents
- Verify the right systems are being installed
- Verify the operation of the systems
- Document the entire project

Price vs. Cost

- Price is something you pay one time
 - Cost is what it takes to operate



PRICE

QUALITY

SPEED

Pick any Two

What is Commissioning

- Commissioning is a process to verify that the owner has received what they contracted for during the programming and design phases and during the construction phase. It also gives them a comfortable feeling of knowing someone is looking out for them throughout the project and the 1st year of occupancy.
- It also verifies that the architects and engineers have received the systems they designed and approved.

Commissioning is

- Review the Test and Balance
- Participate in Start-up
- Develop Plan Reviews
- Review Design
- Participate in Contract Administration
- We will do Inspections

Commissioning – Where it came from and where it is going

- G. Edwards Deming developed TQM in the late 50's and early 60's then improved the process in the 70's
- No one would listen to him.
- Europe, Australia and Asia had a process that some US companies wanted to utilize.
- November 1984 ASHRAE Committee GP-1 was organized.
- 1990 GP-1 was published

Commissioning – Where it came from and where it is going

- ASHRAE GP-0 was revised in 1996
- GP-1.1 was published in Salt Lake City 2008
- Total Building Commissioning document is being developed by ASHRAE and NIBS.
- ASHRAE commenced looking at other systems in 1991.
- There are other organizations presently developing there own documentation.

Commissioning – Where it came from and where it is going

- **It is mandatory to commission all LEED projects to a specified level.**
- **Some states have mandated that state owned or leased buildings be commissioned.**
- **US FEDERAL GSA has mandated that GSA buildings be commissioned.**
- **More and more hospitals are now requiring commissioning.**
- **Commissioning is a standard in Canada.**

Why Required?

- **Low quality construction-construction deficiencies**
- **Complex systems – difficult to test**
- **Integrated systems – do cause problems**

ASHRAE Guideline 0-2006

Describes the commissioning process that will ensure HVAC systems perform in conformity with design intent and owner's project requirements

ASHRAE GP 1.1

- **GP 1.1 is the HVAC commissioning process it was published in 2008.**
- **There are other sections being written by other organizations such as NFPA, IEE, IES, AIA and others**

Phases of Commissioning

- Pre-Design
- Design
- Construction
- Occupancy
- Project turnover
- Warranty

Systems Commissioning

- Verifies operation of components under various conditions
- Verifies interaction between systems and subsystems
- Documents performance of systems to design criteria
- Instructs building personnel on proper operation of systems
- Ongoing after building occupancy as requirements change

Who are the Players

- Architect
- Engineers
- Owner's Representative
- Construction Manager
- Mechanical Contractor
- Electrical Contractor
- Controls Sub-Contractor
- Others as deemed necessary

Responsibilities

ARCHITECT/ENGINEER

- Be a team player
- Design the project with owner's thoughts and requirements in mind
- Be willing to make changes
- Attend and participate in the commissioning meetings
- Attend and participate in the owners project requirement meeting

Responsibilities *(Cont.)*

- With the assistance of the CxA develop the basis of design document
- Answer RFI's in a timely manner
- Answer change orders in a timely manner
- Attend and participate in the VE process

Responsibilities *(Cont.)*

OWNER'S REPRESENTATIVE

- Make decisions in a timely manner
- Attend and participate in owners project requirement meeting
- Attend and participate in commissioning meeting
- Must own commissioning authority's contract
- Make self available for meetings
- Approve the owners project requirement document
- Approve the commissioning plan

Responsibilities *(Cont.)*

CONSTRUCTION MANAGER

- Manages the project
- Coordinates sub-contractors work
- Attend and participate in the commissioning meetings
- Attend and participate in the Owner's Project Requirement meeting
- Attend and participate in the VE process
- Have coordination drawings developed

Responsibilities *(Cont.)*

MEP CONTRACTORS

- Install their respective work
- Complete the various checklist
- Be a part of the commissioning team
- Attend and participate in the owners project requirement meeting
- Attend and participate in the commissioning meetings
- Attend and participate in VE process
- Be a team player

Responsibilities *(Cont.)*

COMMISSIONING AUTHORITY

- Manage the commissioning process
- Develop the commissioning plan
- Develop the commissioning specifications
- Work with all the other team members
- Develop the owner's project requirement document
- With the assistance of the engineer develop the basis of design
- Verify mold and mildew concerns

Responsibilities *(Cont.)*

COMMISSIONING AUTHORITY

- Conduct the commissioning meetings
- Review the project in a timely manner
- Review the submittals for compliance
- Review the warranties for the record
- Review the checklist
- Perform the FPT
- Turn building over to the owner
- Not responsible for the design

CxA Responsibilities During Design

- Review the SD documents and issue comments to the design team
- Review the DD documents and issue comments to the design team
- Review the CD documents and issue comments to the design team
- Work with the VE process
- Always ask for the yellowed out mark-ups and compare with new drawings

O & M Manuals

- Should be received within 60 days after approved submittals have been returned
- Review with owner and give comments back to contractor for compliance
- Use this as your training Bible
- Be careful what you get in the O & M
- You do not need installation material

Training

- Factory witness testing on major pieces of equipment
- Get factory training out of way up front
- Training should be in a classroom setting and also at the respective piece of equipment.
- Use factory trainers not the local sales rep

Documentation Required

- Owners Project Requirement Document
- Commissioning Plan
- Basis of Design
- Contract Documents
- TAB Report
- Draft of the Final Commissioning Report
- Warranties
- O & M Manuals

Documentation Required *(Cont.)*

- Approved Change Orders
- AS-Built Drawings
- All testing data verification and documentation.
- Sequence of Operation
- Minutes of Meetings
- Local Jurisdictional Inspection documentation and records

Benefits of Commissioning

- Project on time
- Establish & maintain energy and maintenance budgets.
- Change orders are greatly reduced
- Claims are greatly reduced
- Punch list is non-existent
- Operators have correct training

Benefits of Commissioning *(Cont.)*

- Absenteeism has diminished.
- Users have been able to take ownership.
- Lasting professional relationships have been developed
- Buildings and systems are operating as owner predicted

Owner's Comments

- Kept politics out of project
- Worth the money
- Will definitely continue the process on other projects
- Project was on time & budget
- Systems are working as requested
- Occupancy is stable
- Training was a major factor in the process
- Maintenance is manageable and understands the systems

Coil Damaged Beyond Repair



**With Corrective Action, Savings to
\$15,000**

Water & Oil - OSHA Violation



**Cost Avoidance, possibility of OSHA
\$25,000 fine. Potential for worker injury.**

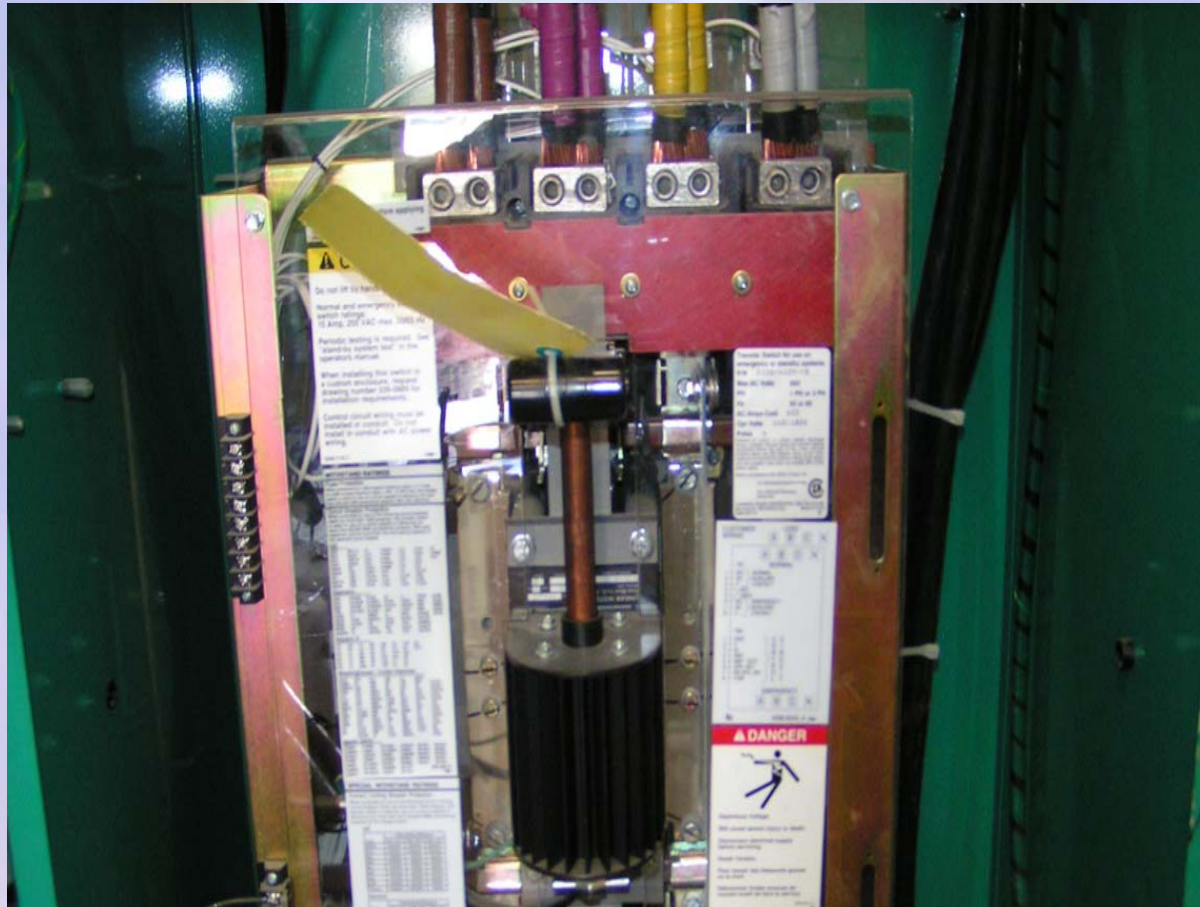
Corrosion Inside & Out

Condenser water pipe serving cooling towers damaged acid in water overspray.



**Without rectifying,
potential \$2.250,000 cost
to replace damaged chillers
& towers.**

Inside ATS for 330kW Generator #1: Improper installation requires hand operation.



Unchanged, increased M&O cost \$5,000

Water Line Misplaced



Broken waterline could result in thousands of dollars in damages and work delays.

Variable Frequency Drives installed w/o air space



Moisture & lime degrade units causing premature failure: \$15k/unit to replace.



**Remember
Commissioning is
A
Quality Process**

Questions

Thank You

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