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# Intro to Commissioning & Retro-Commissioning

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# The Commissioning Process

## **ASHRAE's Guideline 0-2005 definition of the Commissioning Process:**

“A quality-focused process for enhancing the delivery of a project. The process focuses upon verifying and documenting that the facility and all of its systems and assemblies are planned, designed, installed, tested, operated, and maintained to meet the Owner's Project Requirements.”

# Types of Commissioning

**New Building Commissioning** – Occurs during the pre-design, design and construction. Ensures that systems and equipment in new buildings operate properly in accordance with Owner's requirements.

**Re-Commissioning & Retro-Commissioning** – Applies to commissioning of existing buildings. Includes testing and adjusting building systems to meet original design intent and/or optimize systems to satisfy shifting needs. Strives to bring performance back to original design intent and efficiency.

# Types of Commissioning

**Continuous Commissioning** – This is a trade marked name by the Energy Systems Lab. It is an ongoing process to resolve operating problems, improve comfort, optimize energy use and identify retrofits for existing buildings.

**Value Re-Commissioning** – focuses on the most common opportunities that provide the shortest payback. These get incorporated into the O&M procedures. It is often the lowest cost option for Federal facilities.

# The Commissioning Process

FEMP describes this as a four step process. The following is a generalized description of the process. It holds true across all forms of Commissioning for NC and EB

1. Planning
2. Investigation
3. Implementation
4. Hand-Off and Integration

Note the similarity to the Lean Six Sigma DMAIC process. Define, Measure, Analyze, Improve and Control

# #1 Planning

Includes developing and agreeing upon the overall commissioning objectives and strategies, assembling the project team and compiling building and equipment documentation. Objectives in this step include:

- Optimizing building operations to reduce operating costs
- Addressing occupant complaints on comfort and IAQ
- Creating a model facility
- Improving O & M and reducing emergency calls
- Identify the owner's desires and needs – CTQs  
“ Critical To Quality”

# #2 Investigation

Includes:

- Site assessment
- Development of functional test and monitoring plans
- Analyze test results
- Compile list of deficiencies
- Recommend improvements
- Estimate savings in energy and costs

# #3 Implementation

Evaluate recommendations including construction costs, Life Cycle Costs, benefits, and energy.

Implement those which are selected. Actions may include:

- Making repairs and improvements
- Retesting and re-monitoring
- Control systems, EMCS, BAS – calibrate, reprogram, implement new control strategies
- Fine tuning
- Revising energy and cost savings

# #4 Hand-Off and Integration

Prepare final documentation of the commissioning effort. It includes the processes, systems information, individuals, and actions taken during the process. An entire log of measurements and what conditions they were taken under.

Include a plan for future commissioning of the “Existing Building” such as:  
recommissioning or retro-commissioning. Suggest that it also include a plan for “Continuous Commissioning.”

**Hint: DO NOT relegate these docs to the back of the bookcase! True commissioning is never done.**

# Commissioning for NC

## Referencing ASHRAE's Four Step process for NC

### 1) Pre-Design Phase:

- Critical to define & develop Owners Project Requirements
- Develop the Commissioning Plan

### 2) Design Phase – Owners' Requirements are translated into construction docs:

- Confirm the construction docs support the owners requirements
- Development of construction checklists, systems manuals, training requirements, submittal review process

# Commissioning for NC

**3) Construction Phase** – systems and assemblies are installed, inspected, tested and placed into service to meet the Owners Requirements

- Submittals verification
- Verification that systems and equipment are installed according to requirements
- Perform functional testing of those systems and equipment
- Provide training for owners operations people
- Verify systems manual updates
- Prepare the Construction Phase Commissioning Process Report

# Commissioning for NC

**4) Occupancy and Operations Phase** - begins at “substantial completion.” During this phase, the ongoing operation, maintenance, and modification of the facility systems and assemblies, and their associated documentation are verified against the Owners updated requirements. Includes preparation of:

- Final Commissioning Process Report
- List training requirements for the first year of operations
- List of warranty items to be checked out
- List of requirements for periodic retesting and seasonal testing

# Commissioning of Existing Buildings?

**Why should we be interested in  
Commissioning Existing Buildings?**

**When should we begin to consider  
commissioning an Existing Building?**

# How much can be saved by Commissioning an Existing Building?

**“It Depends” ----- upon how well you compare to other similar buildings. Do some baseline and/or benchmarking comparisons.**

- **What is your Energy Utilization Index? Don't know, start with an ASHRAE Level 1 Energy Audit**
- **What is your Energy Star Rating? Don't know, use the Portfolio Manager tool.**
- **Compare to the Commercial Building Energy Consumption Survey, CBECS. Provides btus/sq ft for many building types.**

# Commissioning Savings

**If your Energy Star rating is high, 75 or more, or you EUI is very low, btus/sq ft, for your building use type, there may be little to save, you are already efficient. But beware, there's a lot to lose. Remember "entropy."**

**If your efficiency is poor in comparison to other similar facilities, then the % difference, i.e. higher your energy consumption is, indicates your savings opportunity target.**

# NC Design/Build Case Study

A New Building using Design/Build – Owner requires LEED NC 2.2 Silver and 30% better than ASHRAE 90-2004 for energy efficiency. Owner's contract with Design/Build contractor specifies no R22 in HVAC equipment. LEED prerequisite for basic commissioning was in force.

Finding: upon walkthrough near end of construction, observed HVAC contractor installing R22 equipment.

**Discussion: The Owner is concerned.  
Why???**

# Websites for More Information

- ASHRAE.org
- [https://www1.eere.energy.gov/femp/operations\\_maintenance/om\\_ccguide.html](https://www1.eere.energy.gov/femp/operations_maintenance/om_ccguide.html)
- [https://www1.eere.energy.gov/femp/pdfs/OM\\_7.pdf](https://www1.eere.energy.gov/femp/pdfs/OM_7.pdf)
- <http://www.eia.doe.gov/emeu/cbecs/>