5 STEP APPROACH FOR TOTAL BUILDING COMMISSIONING

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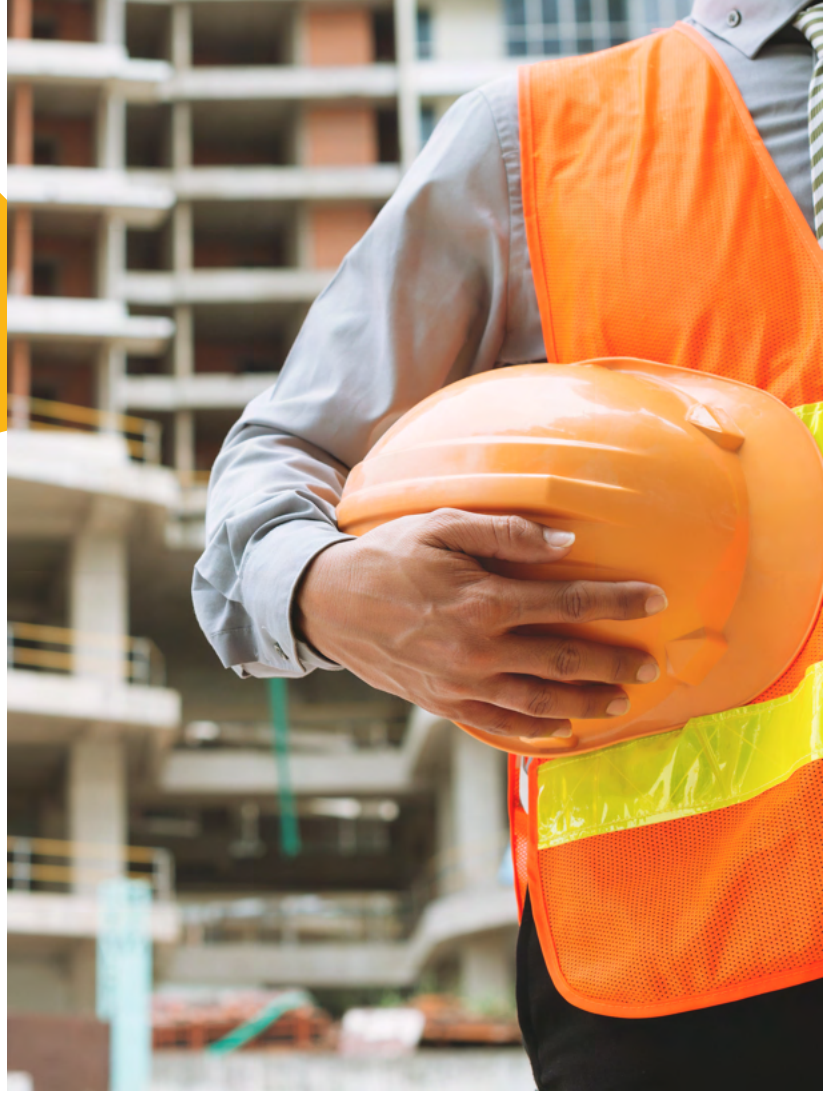
COMMISSIONING IS AN INVESTMENT IN YOUR FACILITY AND IMPROVES TOTAL COST OF OWNERSHIP

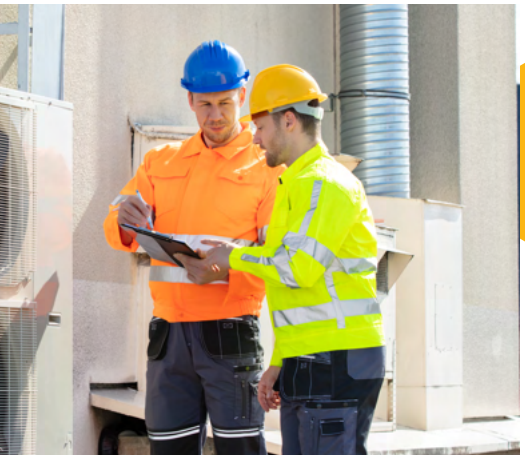


Facility Owners and Managers are very familiar with the activities and responsibilities that come with facility ownership: design, construction, maintenance, energy costs, and occasional major renovations. However, the Commissioning Process is also very important, but very frequently overlooked. Many facilities have never been commissioned, which leads to poor equipment performance and higher ownership costs. Occupant health and comfort can also be negatively impacted as well.

WHAT IS COMMISSIONING?

In simple terms, Commissioning (Cx) is a process that keeps facilities under optimal operating conditions. This is accomplished by comparing actual operation with a series of predefined metrics and making the necessary corrections when a building system falls short. Cx plays a critical role in ensuring the success of your project, providing you as the owner/manager with the assurance that what is being delivered to you matches the original agreement and established system requirements. To make Cx possible, there are two important requirements:

1. Establish a performance baseline, to serve as a reference for building systems. You cannot evaluate building performance if there are no metrics for comparison.
2. Define how performance will be reported. Communication between consultants, engineers, contractors, and maintenance departments is much simpler when documentation is standardized.



TYPES OF COMMISSIONING

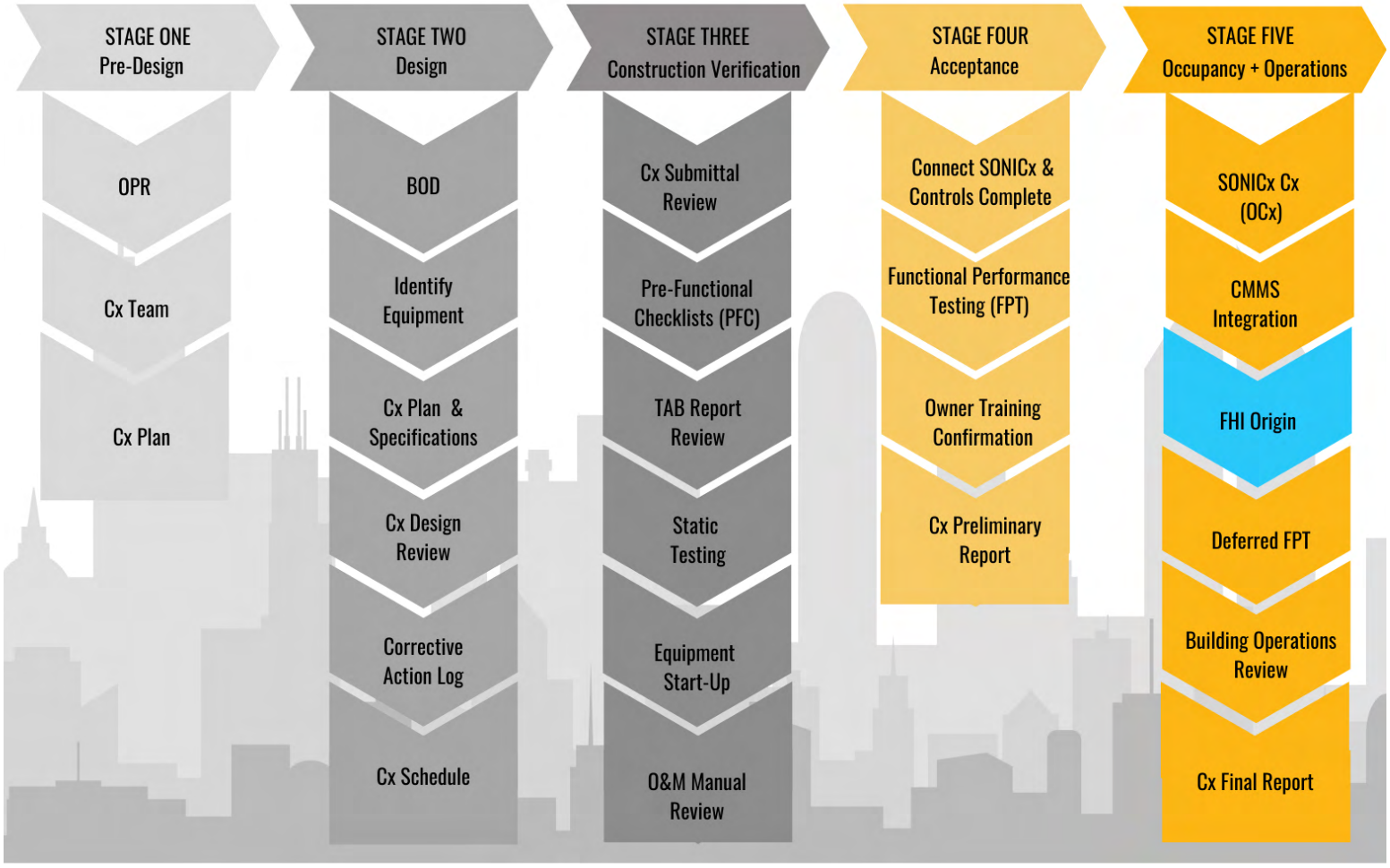
Based on when commissioning is carried out, and the existing building conditions at the time, different processes can be used, those include:

- New Building Commissioning (Cx)
- Re-Commissioning (ReCx)
- Retro-Commissioning (RCx)
- Monitoring-Based Commissioning (MBCx)

SYNERGY'S COMMISSIONING PROCESS

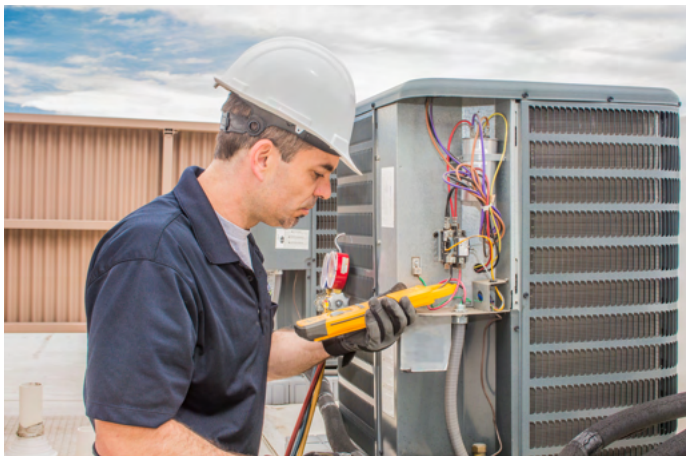
Synergy employs a thorough 5-Step Process, so Owners receive the full value of having a facility that has been meticulously commissioned.

Synergy Engineers Commissioning Process



BENEFITS OF COMMISSIONING

Commissioning tends to have a very high Return on Investment (ROI), and a payback period of less than one year. This is because Cx consists mostly of inspection, analysis, control adjustments, and low-cost reparations, and there are no major capital expenses. Building systems can sustain the operating conditions as specified in design documents, and ownership costs are kept low. **In a study with 643 buildings, the Lawrence Berkeley National Laboratory determined that commissioning reduces energy expenses by 16% in existing buildings, and 13% in new buildings (on average).** Fixing performance issues during the design phase of a project is cheaper than modifying completed work, and pro-active maintenance has a lower cost than solving problems after they occur. Commissioning should be considered an investment, given its long-term benefit in terms of building performance. Cx also makes energy efficiency measures more valuable, preventing a decrease in energy savings over time.



STAGE 1: PRE-DESIGN

The Pre-Design Phase defining the Owner's Project Requirements (OPR) and outlining the Commissioning Plan, Team, Scope, and Budget.

Create an Owner's Project Requirement (OPR)

An OPR sets expectations and goals as well as sets a benchmark to track. An OPR requires the Owner's input and approval before moving forward with the project. The architect develops the Basis of Design (BOD) to coincide with the OPR. An OPR defines all building systems related to:

- Design and construction processes
- Schedules
- Energy efficiency and sustainability
- Indoor environment quality (temperature, humidity, venting, and lighting)
- Safety and security
- Redundancy
- Staff training
- Ongoing Commissioning (OCx)

STAGE 2: DESIGN

The Design Phase includes two major components: Commissioning Specifications and Design Review.

Commissioning Specifications are developed and outline the requirements for the following:

- Submittals
- Cx Meetings
- Cx Scheduled
- Test readiness
- Test and Balance
- Issues log
- Checklists and execution
- Functional tests procedure
- Training
- O&M Manuals
- Startup processes
- Measuring instruments and calibration
- Project turnover documentation
- Sampling

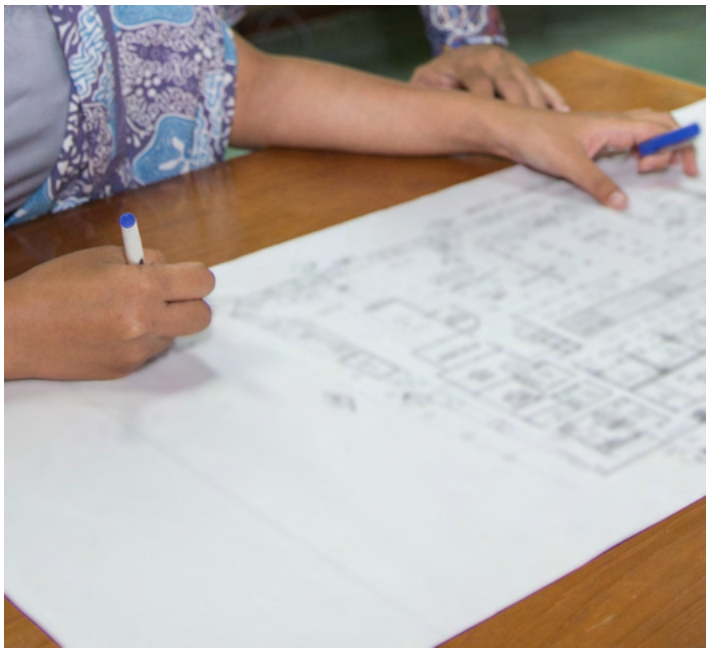
Design Review

The Design Review phase includes four main components: (1) CxP Reviews, (2) Documents Issues, (3) Discuss Issues with Design Team, and (4) Resolve Issues. A minimum of four design reviews are recommended:

- 100% Schematic Design
- 100% Design Development
- 50% Construction Documents
- 90% Construction Documents

During each review, the CxP documents all non-conforming design issues. At the end of each review, the CxP confirms all previous issues have been resolved. Each design review includes the following:

- Review of discipline-specific compliance with the OPR
- Confirm adequate equipment access
- Verify energy-efficient operation and control sequences

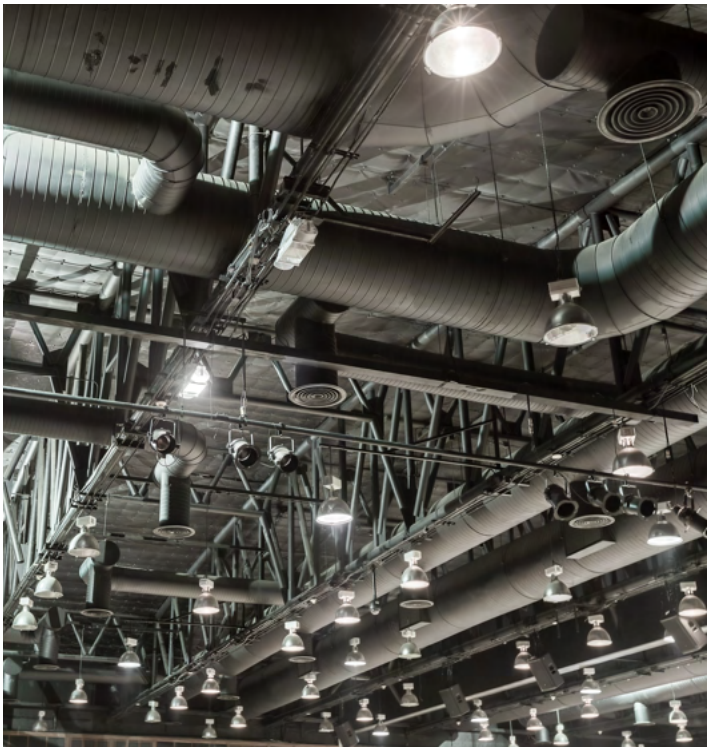


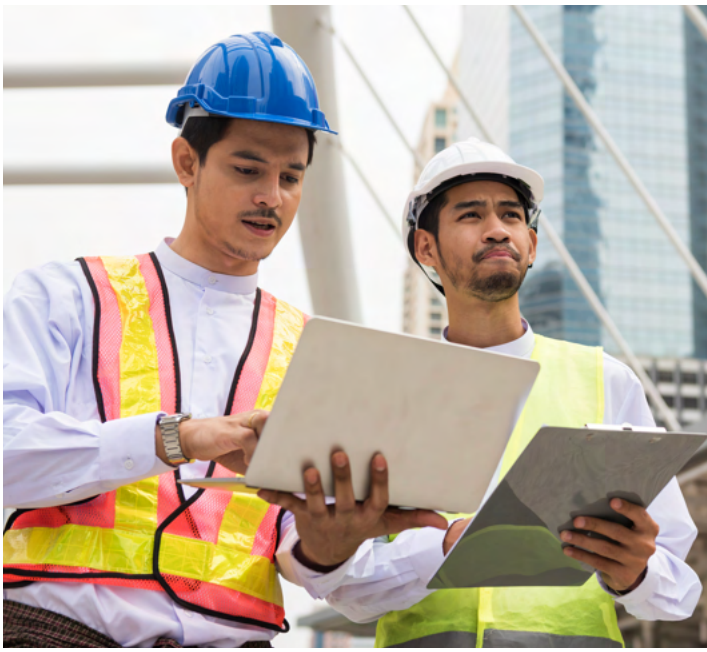
- Identify areas that are not consistent, unclear, or do not meet OPR
- Design reviews are recorded and added to the Cx Plan and Issues Log
  - The Design Team will submit written responses to the design comments
  - The Design review meetings will be held between the CxP and Design team.

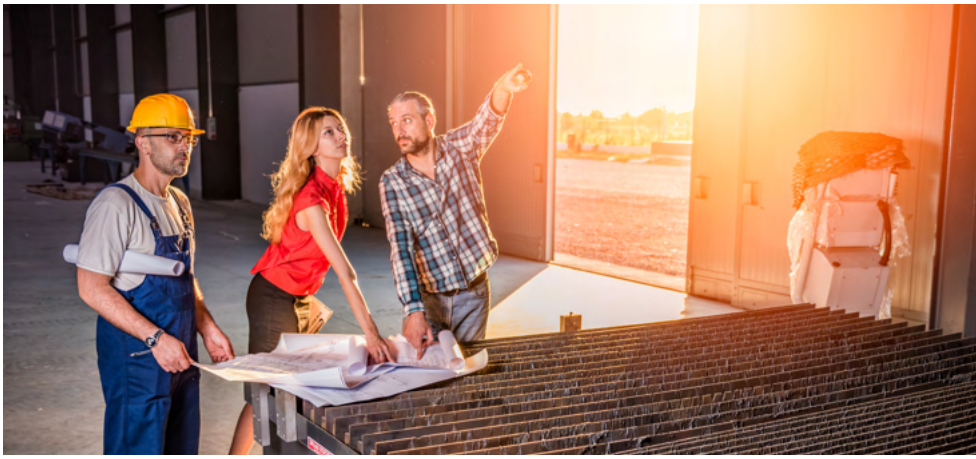
STAGE 3: CONSTRUCTION VERIFICATION

The Construction Validation phase begins with a Cx Kick-Off Meeting and is then followed by Submittal Reviews, Checklists, Start-Up Reports, and Field Observation Reports.

1. **Kick-Off Meeting:** This gives an opportunity to introduce roles, responsibilities, expectations, and deliverables for the duration of the project. From here on out, regularly scheduled Cx meetings are held after checklists, issues, testing, training, O&M manuals, and closeout documents.
2. **Submittal Reviews:** This is a coordinated effort with the design team with a focus on issues relative to commissioning. The submittals must match the drawing schedules and specifications and the information is used to develop checklists and tests.
3. **Checklists:** The checklists are created using approved submittals so they are specific to the installed equipment. The contractor executes checklists and they must: include the manufacturing data, match the drawing details, have adequate maintenance access, and verify the equipment is free of any damage. The Pre-Functional Checklists are necessary for system readiness for Functional Performance Testing and project records.
4. **Start-Up Reports:** The contractor, in alliance with manufacturing representatives, will execute the start-ups. The manufacturer submits the start-up report which is sent to the CxP.
5. **Field Observation Reports:** The CxP performs regular site visits for quality inspections. An Issues log is kept for non-conforming items. The field reports are written for each site visit and are sent to the Owner.

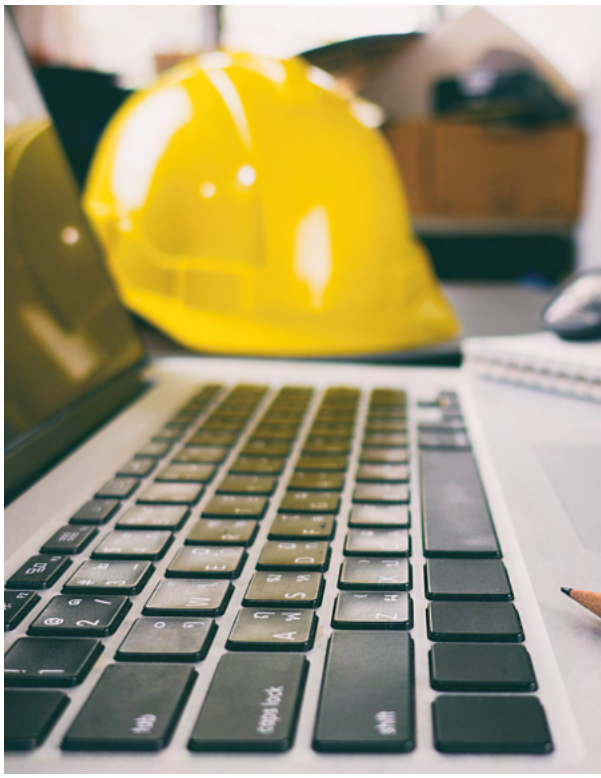






STAGE 4: ACCEPTANCE

This phase focuses on Functional Testing and documentation to provide valuable performance benchmarks, acceptance criteria, and a baseline for future operation and ongoing commissioning.



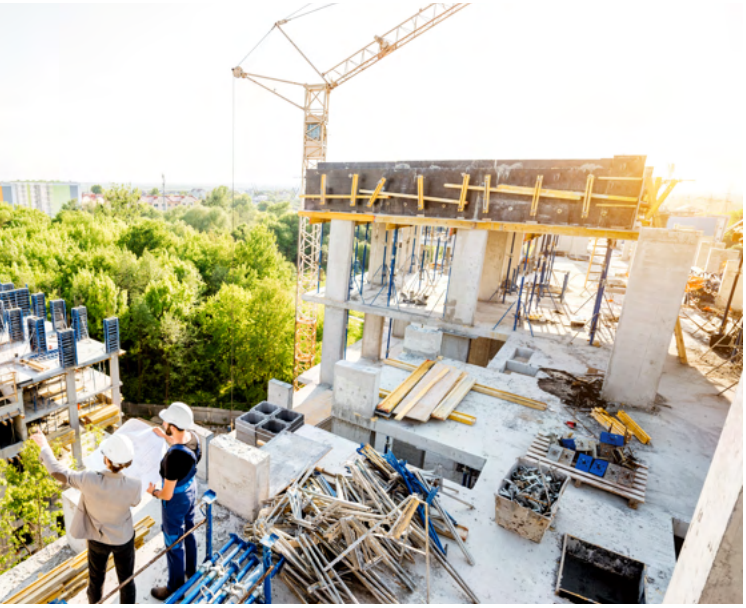
1. **Functional Performance Testing:** Testing is performed on the equipment based on the sequence of operations and the customized test scripts. Any deficiencies are noted in the issues log. The issues are resolved within the commissioning team and re-tested.
2. **Owner Training:** This is typically performed by the manufacturing representative. This gives the operations staff opportunity to familiarize themselves with the new equipment. The preventative maintenance and operating parameters processes are also explained and then finally, the staff is provided with O&M manuals.
3. **Construction Validation Phase Report:** A final report of all work completed up to this point is finalized and delivered to the Owner. This report includes the following:

- Executive Summary
- Project background
- Building description and Cx Scope
- Operating condition of each system
- Deficiencies and corrections
- Uncorrected issues
- Functional test procedures and results
- Schedule for deferred testing (if applicable)
- Record of Operator Training

STAGE 5: OCCUPANCY + OPERATIONS

The Occupancy and Operations Phase ensures that the as-built drawings have been completed and delivered to the Owner. This phase includes (1) Deferred Testing, (2) Ongoing Commissioning Plan, and (3) 10-Month Warranty.

1. **Deferred Testing:** This verifies any further onsite work is completed as well as performing any seasonal or weather-dependent testing is completed. In addition, any Owner's Training that is needed will be completed.
2. **Ongoing Commissioning (OCx):** This is the ideal time to discuss and implement Monitoring Based Commissioning (MBCx), trend analysis, and building optimization.
3. **Building Operations Review / 10-Month Warranty:** For this final step an occupant survey will be issued as well as reviewing work orders and/or complaint logs. A thorough review of alarm histories will be completed and confirmation of equipment operation. All issues will be documented and additional training offered if needed. Finally, documenting the contractor warranty issues before signing off.



SCAN ME

Scan the QR code to talk to us about your facility commissioning needs.

Building reparations and equipment replacements are expensive and disruptive. Commissioning reduces the energy consumption of building systems, prevents expensive breakdowns, and creates better indoor conditions for occupants. Reactive maintenance has been the traditional approach in buildings; fixing issues once they occur. However, this can quickly drain maintenance budgets, and minor issues go undetected. Commissioning provides financial benefits in general, driving up profit margins while reducing O&M expenses.

Systematic and concise commissioning, with documentation, has the potential to shift your facility performance baseline and clarify communication within facility teams. Talk to us today about your Cx needs.