

From Design to Day-to-Day: Developing Systems Manuals and Facility Guides that Work for Operations

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Course Description

Systems Manuals and Facility Guides are integral components of the building handover process and are required by commissioning standards and industry guidelines. However, these documents are often developed from a design or compliance perspective and may not effectively support the needs of owners and facility operations staff.

This webinar examines the purpose and structure of Systems Manuals and Facility Guides as defined by BCxA and ASHRAE guidance, including ASHRAE Guideline 0 and ASHRAE Guideline 1.4. Participants will explore how these documents differ from traditional design and construction documentation and why common project deliverables frequently fall short when used for day-to-day facility operations.

The session will define the essential components of an effective Systems Manual, including system narratives, sequences of operation, key setpoints, and performance intent, with an emphasis on clarity, usability, and long-term value. In addition, the webinar will review various methods for collecting, organizing, and delivering Systems Manuals and Facility Guides to owners and operators, focusing on approaches that support accessibility, consistency, and future updates.

This program is intended for architects, engineers, commissioning providers, facility managers, and project team members involved in the design, construction, turnover, and operation of buildings who seek to better align documentation with operational needs

Learning Objectives

At the conclusion of this program, participants will be able to:

1. Describe the purpose and required components of Systems Manuals and Facility Guides in alignment with BCxA Best Practices, ASHRAE Guideline 0 and ASHRAE Guideline 1.4.
2. Distinguish between design documentation and operational documentation and explain why traditional design deliverables may not meet facility operations needs.
3. Identify the key elements of an effective Systems Manual that support day-to-day operations, including system narratives, sequences of operation, setpoints, and performance intent.
4. Recognize different methods for collecting, organizing, and delivering Systems Manuals and Facility Guides to owners and operators.

Definitions - Systems Manual



A system-focused composite document that includes the design and construction documentation, Facility Guide, operation manual, maintenance information, training information, commissioning records, and additional information of use to the Owner during occupancy and operations

ASHRAE Standard 202 – Commissioning Process

ASHRAE Guideline 1.4 – Preparing Systems Manuals for Facilities

BCxA (Building Commissioning Association) Best Practice Guides

Definitions - Facility Guide



A basic building systems description and operating plan that provides general procedures and confirmed facility operating conditions, setpoints, schedules, and operating procedures for use by facility operations staff to properly operate the facility.

ASHRAE Standard 202 – Commissioning Process

ASHRAE Guideline 1.4 – Preparing Systems Manuals for Facilities

BCxA (Building Commissioning Association) Best Practice Guides

Simplified Definitions



Systems Manual

What the facility is, why it was designed that way, and how systems are intended to perform over the building life cycle.



Design Intent
& Performance
Goals



System
Descriptions &
Components



Sequences
of Operation



Maintenance
Strategy &
Life Cycle



Building Life
Cycle
Perspective



Facility Guide

How to operate the building and its systems day-to-day.



Operating
Instructions



Setpoints &
Adjustments



Schedules &
Modes



Alarms &
Notifications



Roles &
Contacts

Code Requirements

Source	Systems Manual Required?
IECC (C408)	✓ Yes
BCxA Best Practice Guide	✓ Yes
IBC	✗ No (defers to IECC)
ASHRAE 202	✓ Yes
ASHRAE Guideline 0	✓ Yes
ASHRAE Guideline 1.4	— Content & structure
USACE / Federal	✓ Yes

System Manual Contents



Part 1. Executive Summary



Part 2. Facility Design and Construction



Part 3. Building, Systems, and Assemblies Information

System Manual Contents



Part 4. Facility Operations



Part 5. Training



Part 6. Cx Project Report

Facility Guide



Facility operating plan



Final commissioned sequences of operation



Commissioned setpoints

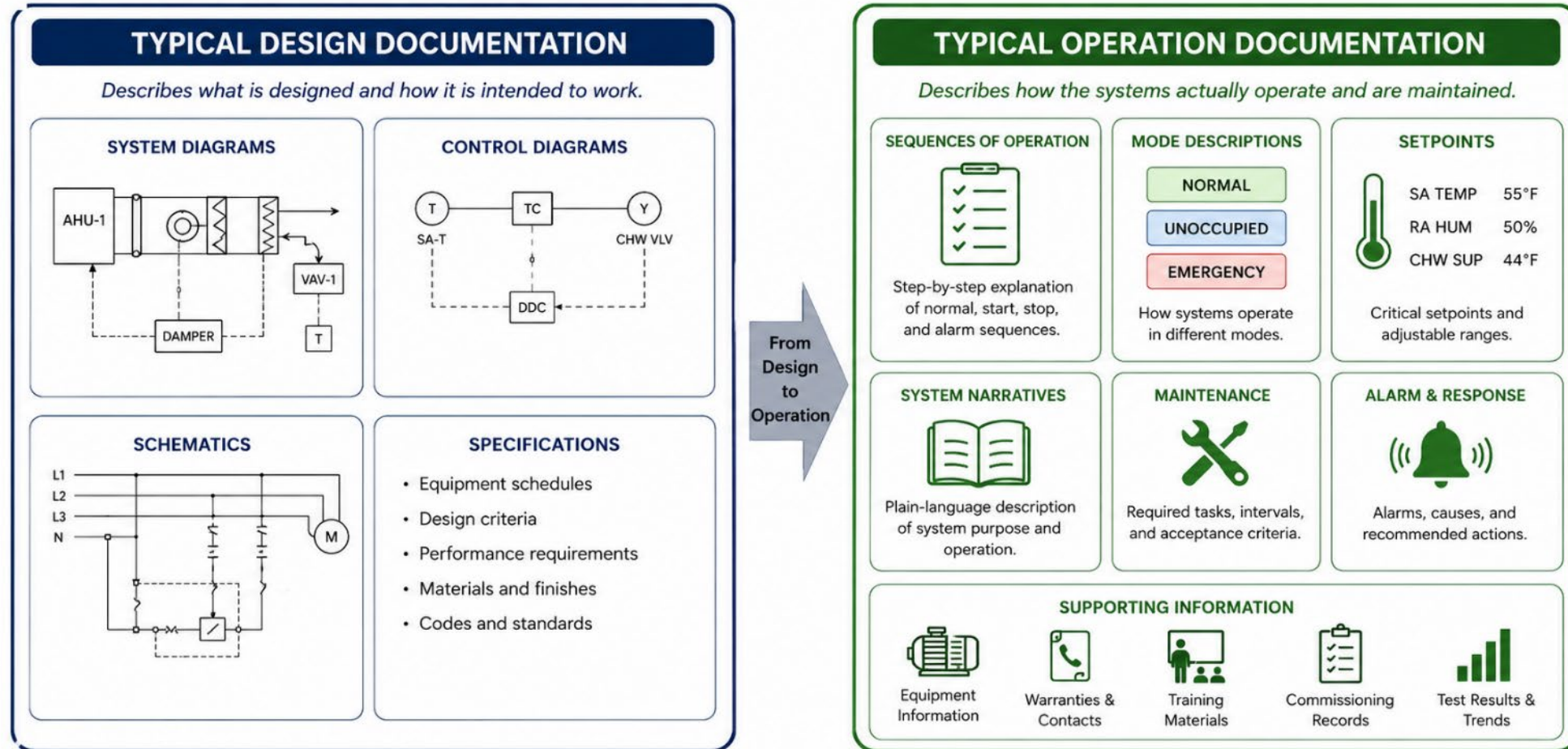


Routine building operations maintenance requirements.



Emergency shutdown procedures

Types of Documents



Typical Design Documentation



Construction drawings and specifications



Basis of Design (BoD) documents



Control diagrams and point lists



Submittals reviewed for code compliance and constructability



Primary Focus:



What to build

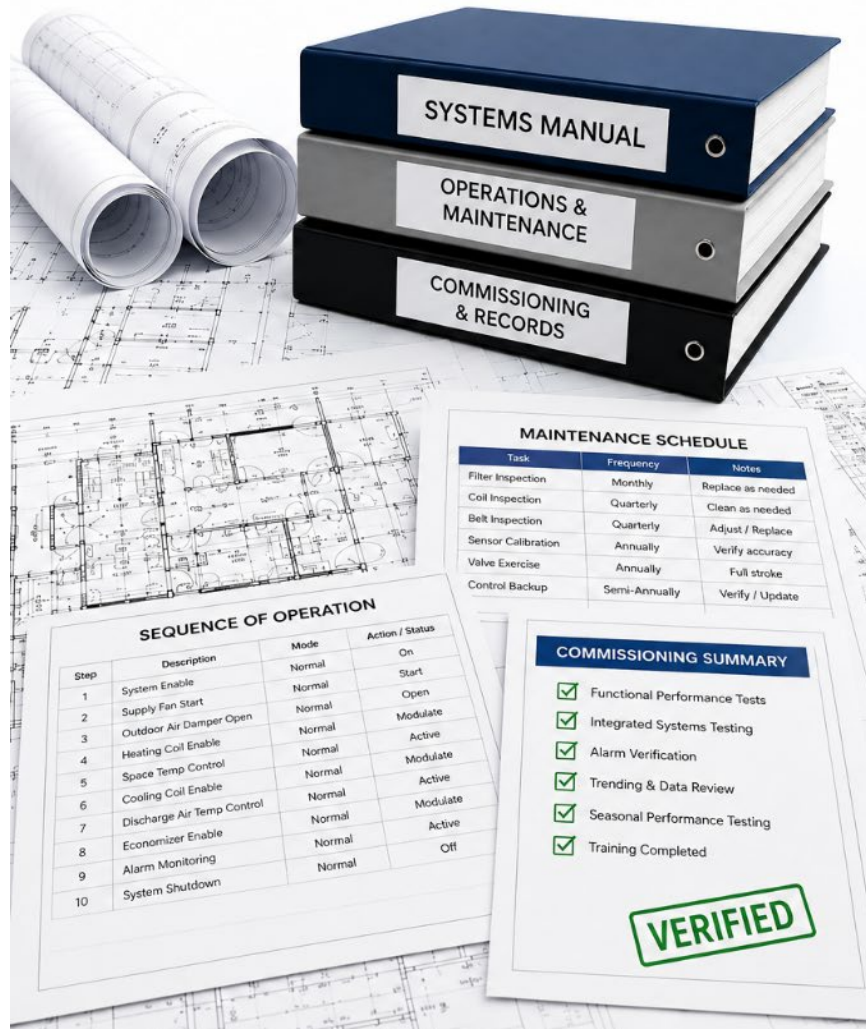


Code compliance



Contractual requirements

Typical Operational Documentation



System and equipment operating procedures



Normal, unoccupied, and emergency modes



Final sequences of operation (as-operated)



Maintenance procedures and intervals



Warranties and service contacts



Training materials



Commissioning records and test results



Primary focus:



How systems are intended to operate



How systems interact in real conditions



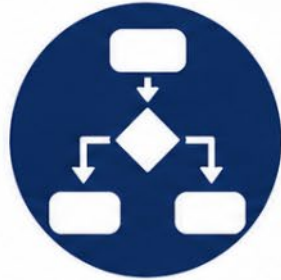
How operators should manage, adjust, and maintain systems

Must Haves



System Narratives

Clear descriptions of each system's purpose, components, and how it operates.



Sequences of Operation

Step-by-step descriptions of normal, startup, shutdown, and alarm conditions.



Setpoints

Critical operating setpoints and ranges for efficient, safe, and reliable operation.



Performance Intent

Design and operational intent to guide decision-making and maintain performance.

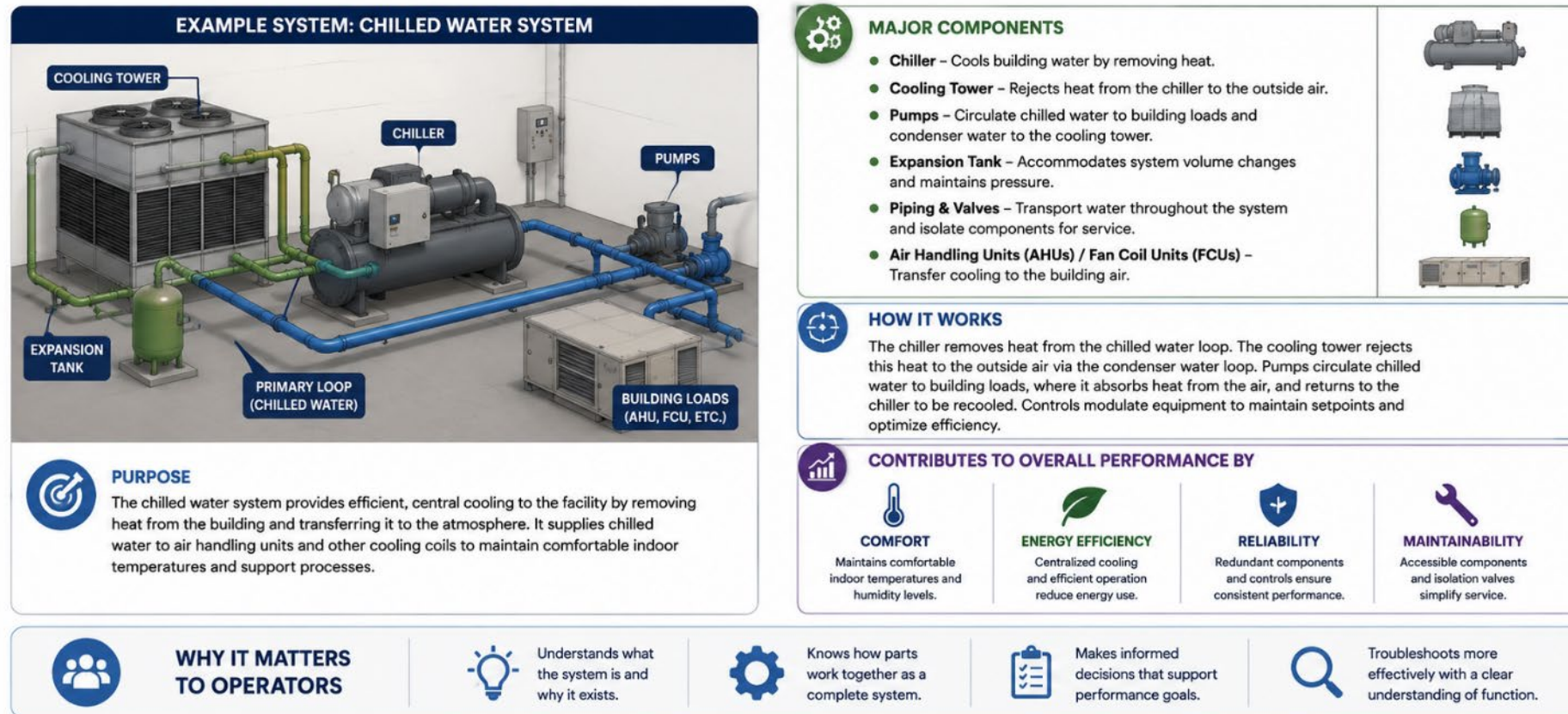


Together, these elements ensure the Systems Manual is a practical, reliable resource that supports effective and consistent facility operations.

Must Haves - System Narratives

SYSTEM NARRATIVE

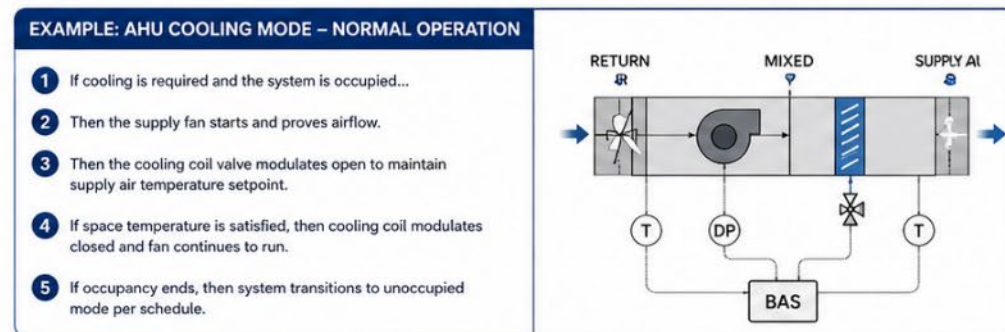
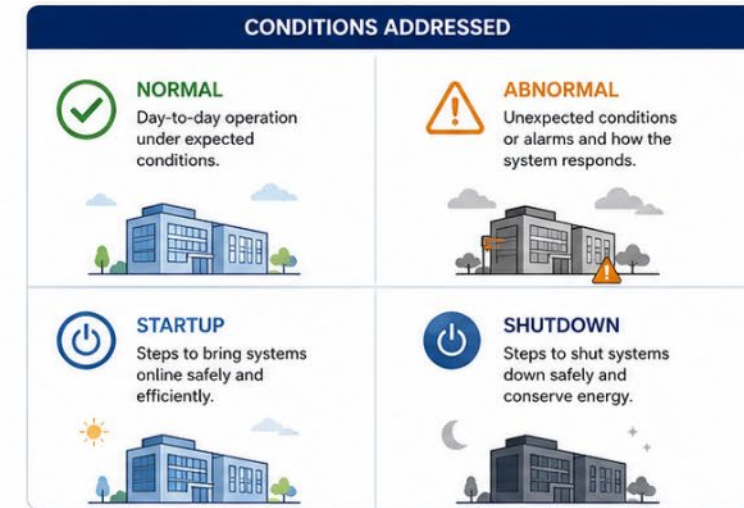
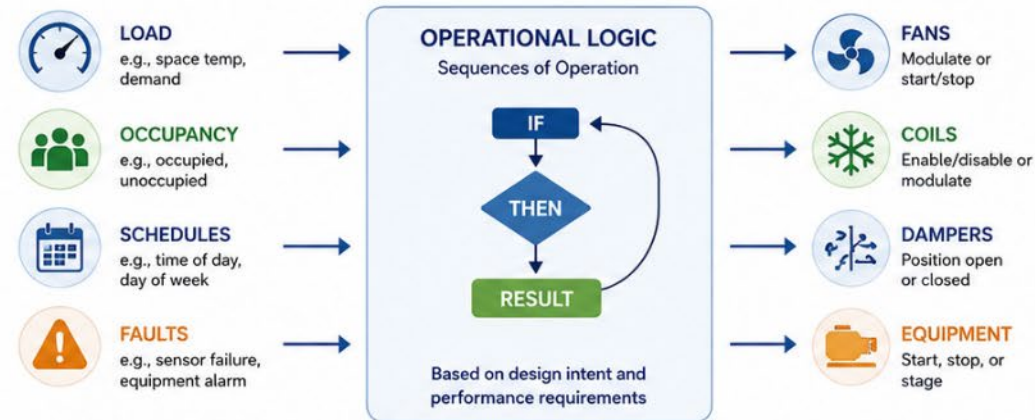
System narratives provide a concise, plain-language description of each major system, including its purpose, major components, and how it contributes to overall facility performance.



Must Haves - Sequences of Operation

Sequences of Operation

Sequences of operation translate design intent into operational logic by describing how systems respond to changing conditions such as load, occupancy, schedules, and faults.



Must Haves - Setpoints and Control Parameters

Documented Setpoints Define Operational Boundaries

Documented setpoints define the operational boundaries of systems, including temperatures, pressures, flows, time schedules, reset ranges, and alarm thresholds.



Temperatures

Example:
Space Temp
72°F ± 2°F



Pressures

Example:
Supply Air Pressure
1.2 in. w.g.



Flows

Example:
Supply Air Flow
10,000 CFM



Time Schedules

Example:
Weekdays
6:00 AM – 6:00 PM



Reset Ranges

Example:
CHW Supply Temp
Reset 44°F – 54°F



Alarm Thresholds

Example:
High Discharge Temp
> 180°F

Setpoint Type



Fixed

Critical for safety,
equipment protection,
or code compliance.



Adjustable

Can be adjusted within
defined limits to
optimize performance.

EXAMPLE: AHU-1 SETPOINT SUMMARY

Parameter	Setpoint	Type	Operational Boundary	Purpose
Supply Air Temperature	55°F	 Fixed	52°F – 58°F	Maintain comfort and humidity control
Supply Air Pressure	1.2 in. w.g.	 Fixed	1.0 – 1.4 in. w.g.	Ensure adequate ventilation
Supply Air Flow	10,000 CFM	 Adjustable	8,000 – 12,000 CFM	Match load and maintain IAQ
Occupied Schedule	Weekdays 6A – 6P	 Adjustable	± 2 hours	Align with building use
CHW Supply Temp Reset	44°F – 54°F	 Adjustable	40°F – 58°F	Optimize energy efficiency
High Discharge Temp Alarm	> 180°F	 Fixed	175°F – 185°F	Protect equipment

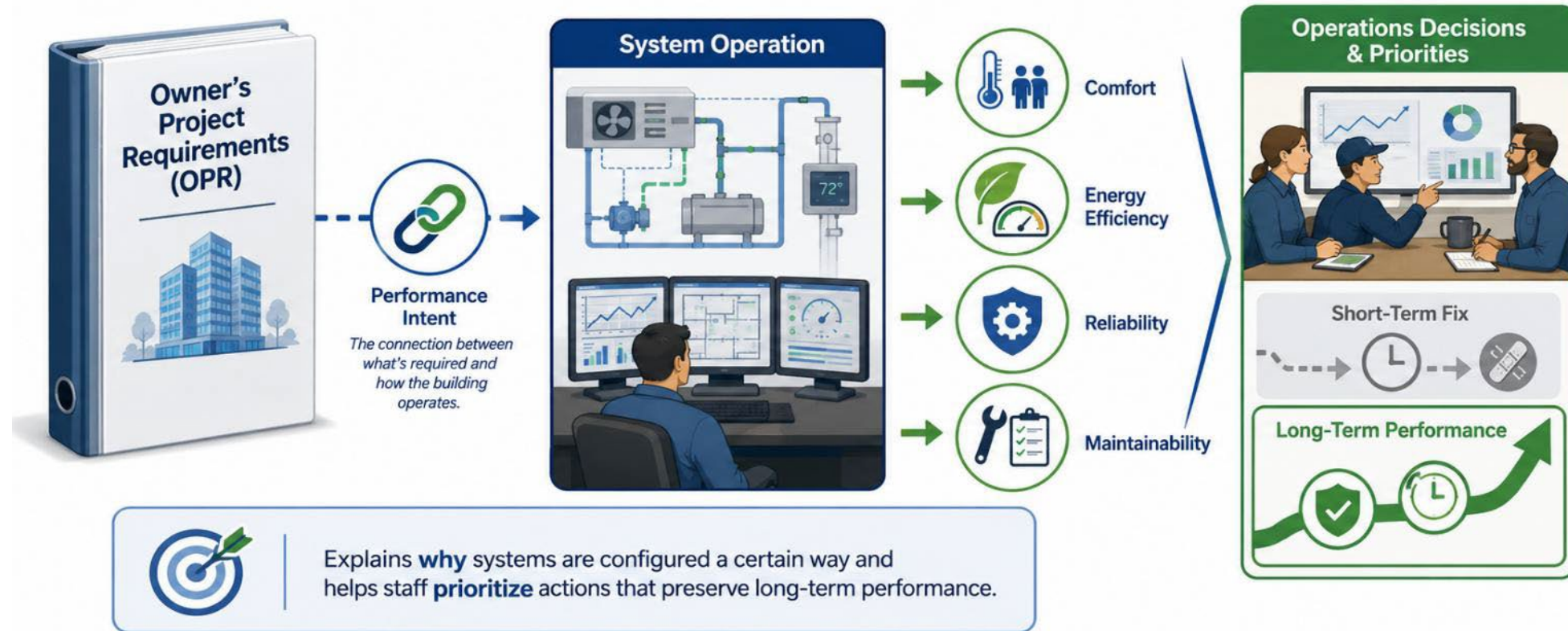


Clearly identifying setpoints—and whether they are adjustable or fixed—helps operators maintain performance, avoid unintended overrides, and understand the impacts of changes.

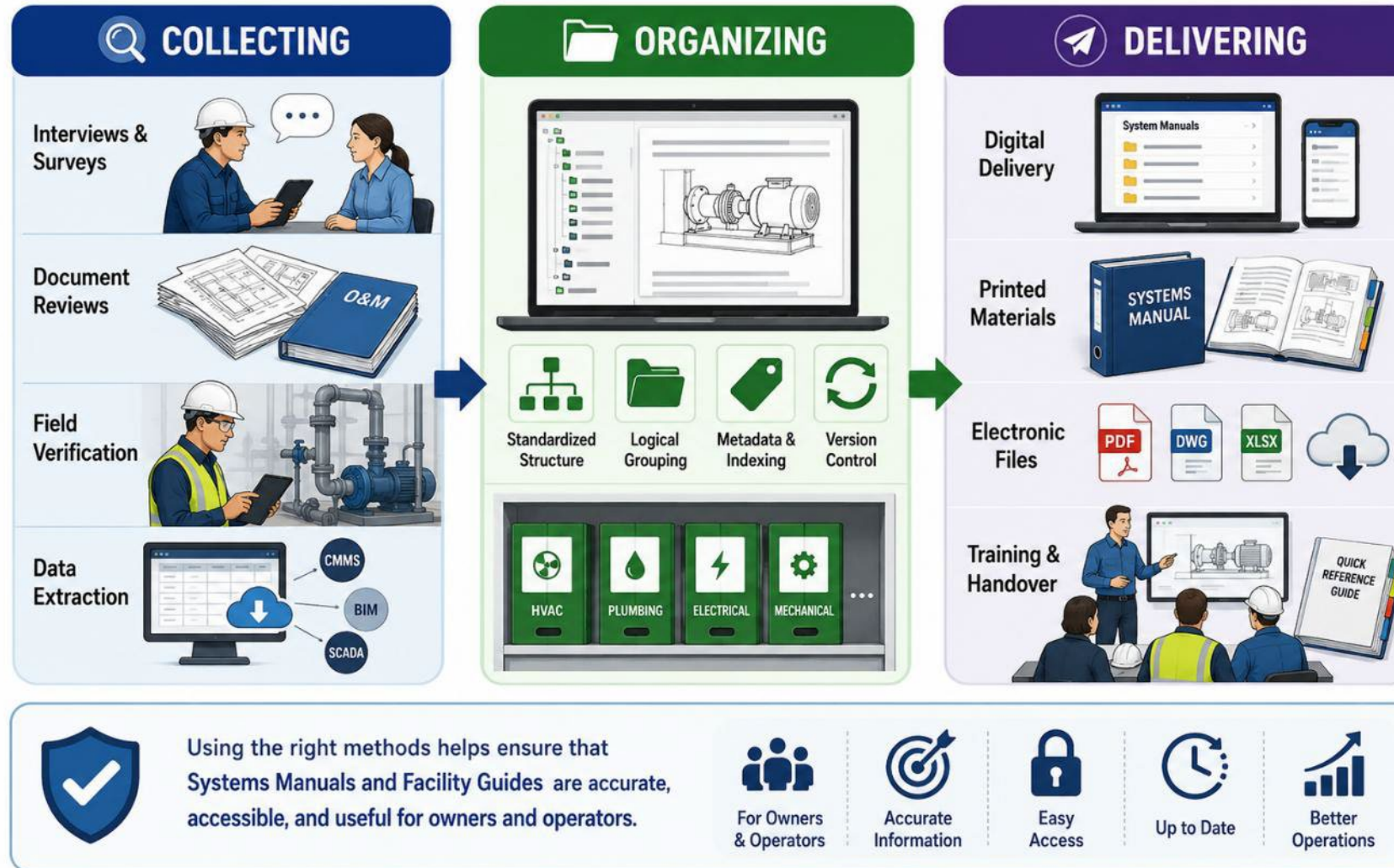
Must Haves - Performance Intent



Performance Intent Links Operation to the OPR



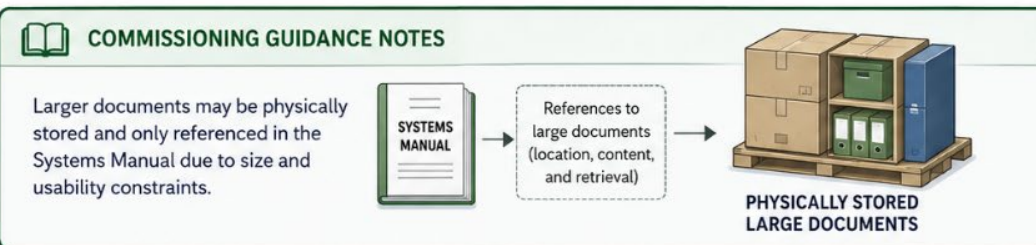
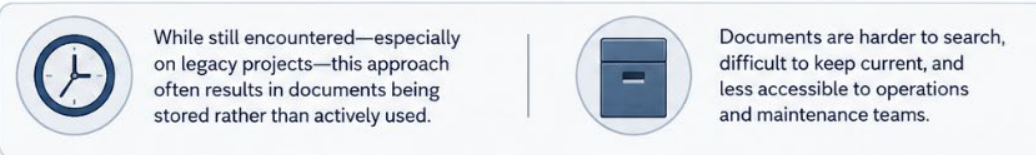
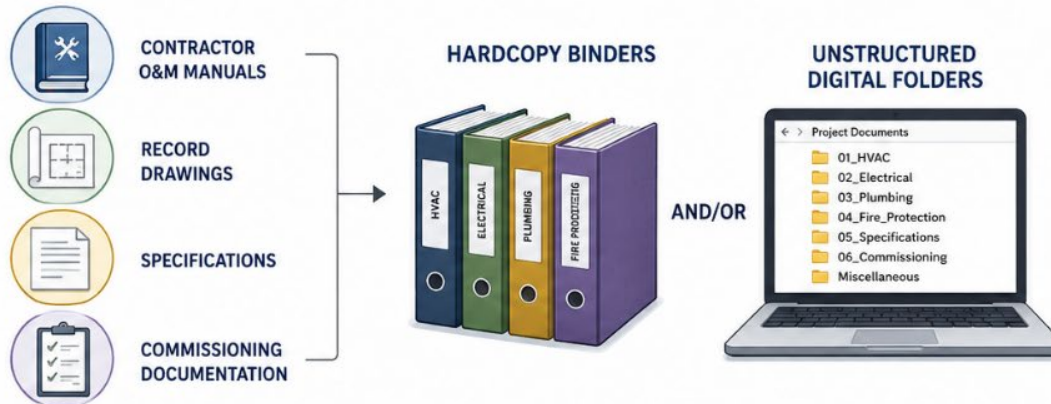
Delivery Methods



Delivery Methods - Traditional Document Collection and Delivery

UNSTRUCTURED HARDCOPY BINDERS AND/OR DIGITAL FOLDERS APPROACH

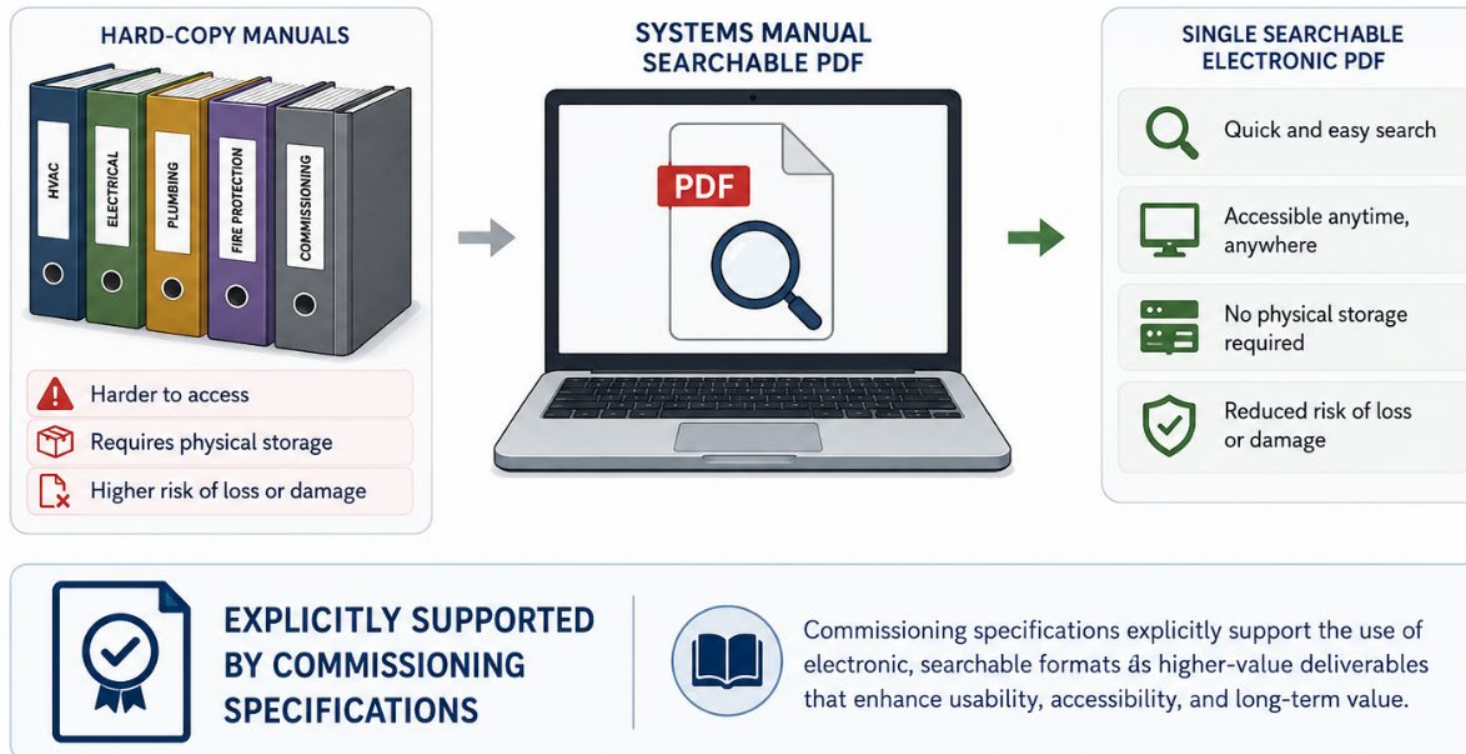
This method involves collecting contractor O&M manuals, record drawings, specifications, and commissioning documentation into hard-copy binders and/or unstructured digital folders.



Delivery Methods - Single Consolidated PDF

SYSTEMS MANUALS

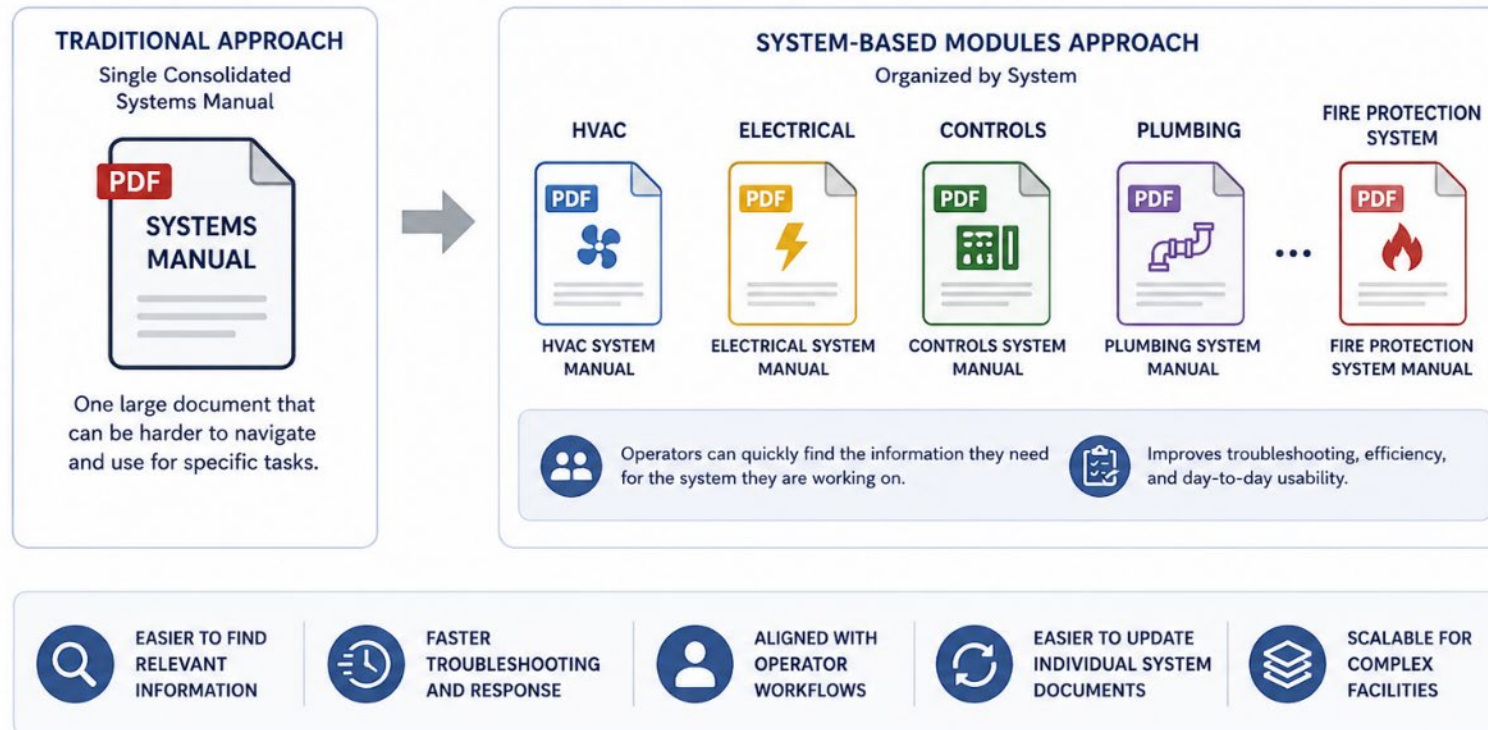
Systems Manuals are commonly delivered as a single searchable electronic PDF, improving accessibility and reducing storage and loss risks compared to hard-copy manuals.



Delivery Methods - Modular Digital Organization

SYSTEMS MANUALS AS SYSTEM-BASED MODULES

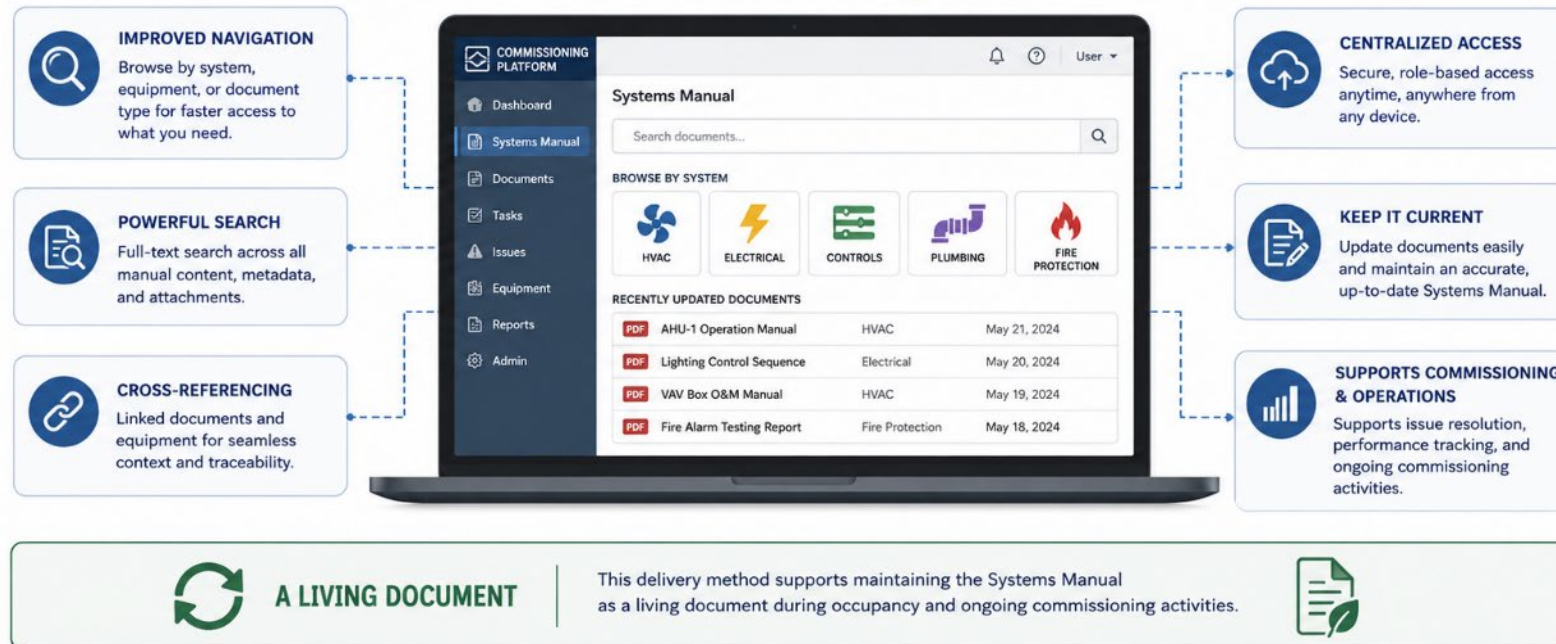
Instead of a single consolidated document, Systems Manuals may be organized as system-based modules (e.g., HVAC, electrical, controls). This aligns with how operators interact with systems and perform troubleshooting, improving day-to-day usability.



Delivery Methods - Web-Based and Platform-Integrated Delivery

SYSTEMS MANUALS DELIVERED THROUGH COMMISSIONING PLATFORMS OR OWNER DOCUMENT MANAGEMENT SYSTEMS

Some projects deliver Systems Manuals through commissioning platforms or owner document management systems, improving navigation, searchability, and cross-referencing.



Delivery Methods - Supplemental and Emerging Access

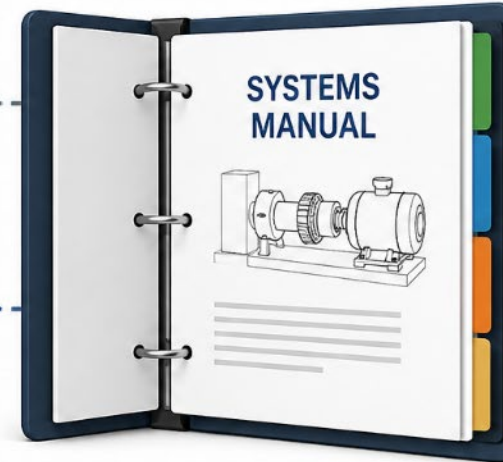
Systems Manuals may be supplemented with:



CMMS equipment and maintenance data



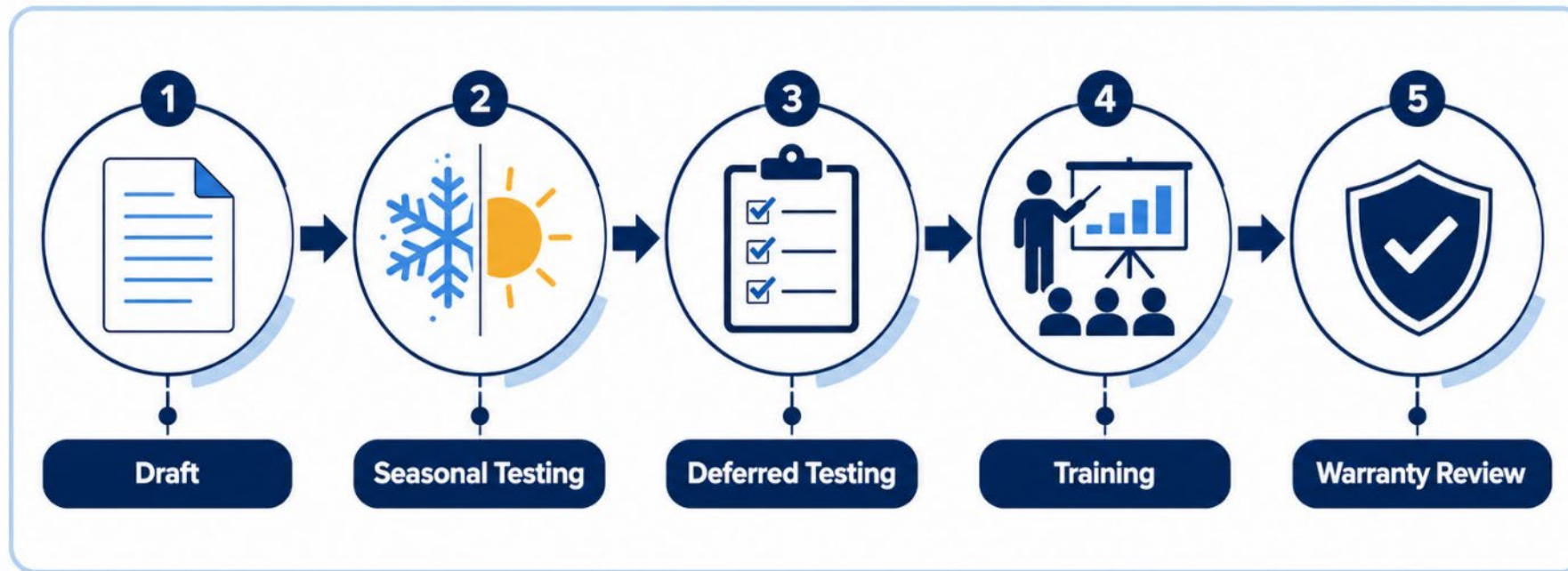
Linked training materials or testing reports



These enhancements improve operator usability but supplement—not replace—the core Systems Manual

Delivery Methods - Phased and Lifecycle-Focused Delivery

Systems Manuals Delivered in Stages



Result: verified operational performance

Comparison

Delivery Method	Description	Pros	Cons	Best Use Cases
 Single Consolidated PDF	One or more large PDFs containing the full Systems Manual or Facility Guide	- Familiar and contract friendly - Easy to distribute at closeout - Simple version control at turnover	- Difficult to navigate and search - Often unused after turnover - Updates require full reissue	- Small or simple facilities - Projects with minimal long-term changes
 Modular Digital Files (System-Based)	Separate files organized by system or discipline (e.g., HVAC, Electrical, Controls)	- Faster access to relevant information - Aligns with how operators troubleshoot issues - Easier to update individual systems	- Requires consistent organization standards - Risk of fragmentation if not well indexed	- Medium to large facilities - Systems with frequent operator interaction
 Web-Based / Platform-Integrated	Manuals hosted in commissioning platforms, owner portals, or document management systems	- Searchable and cross-referenced - Supports updates over building lifecycle - Encourages use as a living resource	- Requires platform access and maintenance - May add upfront setup cost	- Complex facilities - Owners prioritizing long-term performance
 QR Code-Linked Access	QR codes on equipment linking directly to relevant manuals, sequences, or guides	- Immediate field access at equipment - Reduces reliance on printed documents - Supports just in time learning	- Depends on device access and IT policies - Requires disciplined document control	- Equipment-heavy facilities - Maintenance-focused teams
 Video & Multimedia Supplements	Short videos or visual guides tied to system operation and maintenance	- Reinforces training - Useful for turnover and staff changes - Makes complex systems easier to understand	- Not a replacement for written documentation - Requires periodic updates	- Complex or non-intuitive systems - Facilities with frequent staff turnover
 Phased / Lifecycle Delivery	Draft manuals at substantial completion, updated through seasonal testing and warranty	- Reflects actual operational performance - Captures lessons learned post-occupancy - Improves long term accuracy	- Requires sustained commissioning involvement - May not align with traditional closeout expectations	Commissioned facilities with MBCx or warranty reviews

Owner Types

Delivery Method	Owner Type	Facility Complexity	Typical Application
Traditional Document Collection & Delivery	Small private owners; Limited FM staff	Low complexity; Few integrated systems	Meets closeout requirements but limited long-term usability
Electronic PDF Delivery	Municipal owners; K-12; Small higher-ed	Low to moderate complexity	Improves access while keeping delivery simple
Modular, System-Based Files	Higher education; Healthcare systems; Campus owners	Moderate to high complexity	Aligns documentation with operator workflows
Web-Based / Platform-Integrated Delivery	Healthcare; Mission-critical; Large institutional owners	High complexity; Integrated controls	Supports searchability and lifecycle updates
Phased Delivery Through Commissioning & Warranty	Sophisticated owners; Commissioning-literate clients	Moderate to high complexity	Captures seasonal performance and verified operation
Supplemental Digital / Field Access (QR, CMMS)	Owners with mature FM processes	Equipment-dense facilities	Enhances field usability and training

Correct delivery method

Effective delivery methods:

-  Make information **easy to find**
-  Support **day-to-day decision-making**
-  Allow documentation to **evolve over the building lifecycle**

Poor delivery methods:

-  Turn manuals into static closeout artifacts
-  Limit usability for operators
-  Reduce long-term performance value

Delivery method selection impacts usability, maintainability, and long-term operational performance.

Method of Assembly and Responsible Parties



Responsible Party:
The Cx Team

But what does that mean?

Q&A

Mike Amstadt, PMP, BCxP, LEED AP BD+C, QCxP