NFPA®

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Standard for Commissioning of Fire Protection and Life Safety Systems

2021

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NFPA® 3

Standard for

Commissioning of Fire Protection and Life Safety Systems

2021 Edition

This edition of NFPA 3, *Standard for Commissioning of Fire Protection and Life Safety Systems*, was prepared by the Technical Committee on Commissioning and Integrated Testing. It was issued by the Standards Council on March 15, 2020, with an effective date of April 4, 2020, and supersedes all previous editions.

This edition of NFPA 3 was approved as an American National Standard on April 4, 2020.

Origin and Development of NFPA 3

The 2012 edition of NFPA 3, *Recommended Practice for Commissioning and Integrated Testing of Fire Protection and Life Safety Systems*, represented NFPA's first document outlining a systematic approach to provide documented confirmation that fire protection and life safety systems function as intended by the owner and the design team. The genesis of this document was a request from the National Institute of Building Sciences (NIBS) to provide a commissioning document for fire protection systems that would be part of a conglomeration of commissioning documents that could be used to create a total building commissioning program.

NFPA 3 addresses the administrative and procedural concepts of fire protection and life safety system commissioning and also provides direction on the integrated system tests.

This document is designed to identify the commissioning team members, their qualifications, and their roles and responsibilities throughout the commissioning process. Chapter 5 addresses the concept of commissioning from the incipient stages of a project through to the occupancy and operation of the facility. Throughout the commissioning process, there are several key documents that must be identified in the recommended practice, such as the Owner's Project Requirements (OPR) and the Basis of Design (BOD), which provide direction to the commissioning team members as they are executing the commissioning plan. These documents, which are generated during the design phase, are implemented during construction.

NFPA 3 also addresses retro-commissioning and re-commissioning of existing buildings. For existing buildings that have never been commissioned, a retro-commissioning plan can be developed and executed to establish a benchmark for the facility. Existing buildings that have been previously commissioned are periodically re-commissioned and compared to the compliance benchmarks established in the original commissioning plan.

NFPA 3 contains many forms that are available to assist in project documentation and the implementation of the commissioning program.

The largest modification to NFPA 3 for the 2015 edition was the removal of Chapter 7 from the 2012 edition. This chapter addressed integrated system testing as part of the overall fire protection and life safety system commissioning concept. The Technical Committee on Commissioning and Integrated Testing determined that while commissioning fire protection systems was not ready for standardization, there was an imminent need to create a standard for testing integrated fire protection and life safety systems. The technical committee requested to separate the concepts of commissioning and integrated system testing into two documents: the first, a recommended practice on commissioning; and the second, a new standard, NFPA 4, *Standard for Integrated Fire Protection and Life Safety System Testing*, addressing the integrated system testing portion. This restructuring and request for a new project was approved by the Standards Council in October 2011 and resulted in Chapter 7 of the 2012 edition of NFPA 3 being removed for the 2015 edition and using it as the basis for NFPA 4.

In addition to the document split, the technical committee focused on updating the recommendations for existing building commissioning. Additional detail was added to the sections on re-commissioning and retro-commissioning to assist fire commissioning agents in carrying out commissioning projects on existing buildings.

The 2018 edition of NFPA 3 was changed from a recommended practice to a standard in order to be utilized by the commissioning industry and be referenced by other NFPA standards, as well as other commissioning standards. Many of the changes throughout the document were made to reflect the change from recommendations to mandatory requirements. In addition, many of the requirements were reorganized and moved into other chapters to make the standard more useable.

NFPA 3 was originally developed as a recommend practice; however, its ability to be utilized by the commissioning industry is limited as a recommended practice. The document became a standard in 2018 in order to easily be referenced by other NFPA standards, as well as be referenced by other commissioning standards.

The 2021 edition of NFPA 3 contains minor revisions throughout and new annex language to provide clarity on the differences between simple and complex commissioning projects.

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Committee Scope: This Committee shall have primary responsibility for documents that address commissioning and integrated system testing activities and tasks for fire protection and life safety systems. This includes the requirements for planning, organization, coordination, responsibility, implementation, and documentation of commissioning and integrated system testing of active and passive systems and features that serve a fire protection or life safety purpose.

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NFPA 3

Standard for

Commissioning of Fire Protection and Life Safety Systems

2021 Edition

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NOTICE: An asterisk (*) following the number or letter designating a paragraph indicates that explanatory material on the paragraph can be found in Annex A.

A reference in brackets [ ] following a section or paragraph indicates material that has been extracted from another NFPA document. Extracted text may be edited for consistency and style and may include the revision of internal paragraph references and other references as appropriate. Requests for interpretations or revisions of extracted text should be sent to the technical committee responsible for the source document.

Information on referenced publications and extracted can be found in Chapter 2 and Annex F.

Chapter 1 Administration

1.1* Scope. This standard shall provide the required procedures, methods, and documentation for the commissioning of active and passive fire protection and life safety systems and their interconnections with other building systems.

1.2 Purpose. The purpose of this standard is to provide the minimum requirements for the commissioning process to verify fire protection and life safety systems perform in conformity with the owner's project requirements, basis of design, and applicable governing law, codes, regulations, or standards.

1.3* Application.

1.3.1 This standard shall be applicable where required by the owner's project requirements.

1.3.2* Where the project specifications or governing laws, codes, regulations, or standards require total building commissioning, this standard shall apply as part of that process.

1.3.3* This standard shall apply to passive and active fire protection and life safety equipment and systems.

1.4 New Technology.

1.4.1 New technology proposed for installation, for which there is no published product instruction or installation standard, shall function as intended throughout its life cycle in accordance with the owner's project requirements, and basis of design.

1.4.2 Technical documentation shall be submitted to the authority having jurisdiction to demonstrate equivalency.

1.4.3 The system, method, or device shall be approved for the intended purpose.

Chapter 2 Referenced Publications

2.1 General. The documents or portions thereof listed in this chapter are referenced within this standard and shall be considered part of the requirements of this document.

2.2 NFPA Publications. National Fire Protection Association, 1 Batterymarch Park, Quincy, MA 02169-7471.

NFPA 4, *Standard for Integrated Fire Protection and Life Safety System Testing,* 2021 edition.

2.3 Other Publications.

Merriam-Webster's Collegiate Dictionary, 11th edition, Merriam-Webster, Inc., Springfield, MA, 2003.

2.4 References for Extracts in Mandatory Sections.

NFPA 70®, National Electrical Code®, 2020 edition.

NFPA *101®, Life Safety Code®,* 2018 edition.

NFPA 110, *Standard for Emergency and Standby Power Systems,* 2019 edition.

NFPA 1031, *Standard for Professional Qualifications for Fire Inspector and Plan Examiner,* 2014 edition.

NFPA 5000®, Building Construction and Safety Code®, 2018 edition.

Chapter 3 Definitions

3.1 General. The definitions contained in this chapter shall apply to the terms used in this standard. Where terms are not defined in this chapter or within another chapter, they shall be defined using their ordinarily accepted meanings within the context in which they are used. *Merriam-Webster's Collegiate Dictionary,* 11th edition, shall be the source for the ordinarily accepted meaning.

3.2 NFPA Official Definitions.

3.2.1* Approved. Acceptable to the authority having jurisdiction.

3.2.2* Authority Having Jurisdiction (AHJ). An organization, office, or individual responsible for enforcing the requirements of a code or standard, or for approving equipment, materials, an installation, or a procedure.

3.2.3* Listed. Equipment, materials, or services included in a list published by an organization that is acceptable to the authority having jurisdiction and concerned with evaluation of products or services, that maintains periodic inspection of

production of listed equipment or materials or periodic evaluation of services, and whose listing states that either the equipment, material, or service meets appropriate designated standards or has been tested and found suitable for a specified purpose.

3.2.4 Should. Indicates a recommendation or that which is advised but not required.

3.2.5 Standard. An NFPA Standard, the main text of which contains only mandatory provisions using the word "shall" to indicate requirements and that is in a form generally suitable for mandatory reference by another standard or code or for adoption into law. Nonmandatory provisions are not to be considered a part of the requirements of a standard and shall be located in an appendix, annex, footnote, informational note, or other means as permitted in the NFPA Manuals of Style. When used in a generic sense, such as in the phrase "standards development process" or "standards development activities," the term "standards" includes all NFPA Standards, including Codes, Standards, Recommended Practices, and Guides.

3.3 General Definitions.

3.3.1 Basis of Design (BOD). A document that describes the concepts and decisions used to meet the owner's project requirements and governing laws, regulations, codes, and standards.

3.3.2* Building. Any structure used or intended for supporting or sheltering any use or occupancy. [***101***, 2018]

3.3.3 Commissioning.

3.3.3.1 ***Commissioning (Cx).*** A systematic process that provides documented confirmation that building systems function according to the intended design criteria set forth in the project documents and satisfy the owner's operational needs, including compliance with governing laws, regulations, codes, and standards.

3.3.3.2* ***Commissioning Authority (CxA).*** The qualified person, company, or agency that plans, coordinates, and oversees the entire commissioning process.

3.3.3.3* ***Commissioning Plan.*** The document prepared for each project that identifies the processes and procedures necessary for a successful commissioning process.

3.3.3.4 ***Commissioning Record.*** The complete set of commissioning documents for the project.

3.3.3.5 ***Fire Commissioning Agent (FCxA).*** A person or entity identified by the owner who leads, plans, schedules, documents, and coordinates the fire protection and life safety systems commissioning team, and implements the fire protection and life safety systems commissioning process.

3.3.3.6* ***Fire Protection and Life Safety Systems Commissioning (FCx).*** A systematic process that provides documented confirmation that fire protection and life safety systems function according to the design criteria as set forth in the project documents and satisfies the owner's operational needs, including compliance with governing laws, regulations, codes, and standards.

3.3.3.7* ***Fire Protection and Life Safety Systems Commissioning Team.*** A team of qualified individuals or entities tasked with accomplishing the purpose of this standard.

3.3.3.8* ***Re-commissioning (Re-Cx).*** Where existing fire protection and life safety systems have previously been subject to fire protection and life safety systems commissioning, this is the process of reverifying that the system performance continues to meet the owner's project requirements and basis of design.

3.3.3.9* ***Retro-commissioning (Retro-Cx).*** For existing fire protection and life safety systems that were not previously subject to fire protection and life safety systems commissioning, the process of verifying that system performance and operation meet the original design intent, current owner requirements, and governing laws, regulations, codes, and standards.

3.3.4 Component. A part of an architectural, electrical, or mechanical system. [**5000,** 2018]

3.3.5 Construction Document. The plans, specifications, and other documents that describe the construction project.

3.3.6 Drawings.

3.3.6.1 ***Coordination Drawing.*** Reproducible drawings showing work with horizontal and vertical dimensions to avoid interference with structural framing, ceilings, partitions, equipment, lights, mechanical, electrical, conveying systems, and other services.

3.3.6.2 ***Record (Plan) Drawing.*** A design, working drawing, or as-built drawing that is submitted as the final record of documentation for the project. A drawing is also referred to as a plan.

3.3.6.3 ***Shop Drawings.*** Scaled working drawings, equipment cutsheets, and design calculations. [**1031**, 2014]

3.3.6.4 ***Working (Plan) Drawing.*** Those approved plans and drawings that are used for construction of the project.

3.3.7 Emergency Power.

3.3.7.1 ***Emergency Power Supply (EPS).*** The source of electric power of the required capacity and quality for an emergency power supply system. [**110,** 2019]

3.3.7.2 ***Emergency Power Supply System (EPSS).*** A complete functioning emergency power supply system coupled to a system of conductors, disconnecting means and overcurrent protective devices, transfer switches, and all control, supervision, and support devices up to and including the load terminals of the transfer equipment needed for the system to operate as a reliable source of electric power.

3.3.7.3 ***Emergency Systems.*** Those systems legally required and classed as emergency by municipal, state, federal, or other codes, or by any governmental agency having jurisdiction. These systems are intended to automatically supply illumination, power, or both, to designated areas and equipment in the event of failure of the normal supply or in the event of accident to elements of a system intended to supply, distribute, and control power and illumination essential for safety to human life. [**70,** 2020]

3.3.7.4 ***Legally Required Standby Systems.*** Those systems required and so classed as legally required standby by municipal, state, federal, or other codes or by any governmental agency having jurisdiction. These systems are intended to automatically supply power to selected loads (other than those classified as emergency systems) in the event of failure of the normal source.

3.3.8 Inspection. For the purpose of this standard, a visual examination of a system, or portion thereof, to verify that it has been installed in accordance with the construction documents, codes, installation standards, and manufacturer's specifications.

3.3.9* Installation Contractor. A company that provides labor and materials to install systems and equipment.

3.3.10 Integrated Testing Agent (ITa). A person or entity, identified by the owner, who plans, schedules, documents, coordinates, and implements the testing of the fire protection and life safety systems and associated subsystems.

3.3.11 Issues Log. A formal and ongoing record of failures, deficiencies, or concerns, as well as associated priorities, implications, and resolutions.

3.3.12* Narrative. A written summary description of the building(s) or structure(s), including exterior property boundaries and all applicable fire protection and life safety systems and related integrated operational features.

3.3.13 Operation and Maintenance Manual. A system-focused composite document that includes the operation and maintenance requirements and additional information of use to the owner during the occupancy phase.

3.3.14 Owner's Project Requirements (OPR). The documentation that provides the owner's vision for the planned facility, integrated requirements, expectations for how it will be used and operated, and benchmarks and criteria for performance.

3.3.15 Project Phases.

3.3.15.1 ***Planning Phase (Phase 1).*** The phase the fire protection and life safety systems commissioning team is formed and initial project concepts and the owner's project requirements are developed.

3.3.15.2 ***Design Phase (Phase 2).*** The phase the basis of design is produced; drawings and calculations, including those for design and fabrication, are produced; and testing procedures are developed.

3.3.15.3 ***Construction Phase (Phase 3).*** The phase the systems, with their components, are procured, fabricated, installed, tested, and accepted.

3.3.15.4 ***Occupancy Phase (Phase 4).*** The phase the systems are used on a daily basis and periodic inspection, testing, and maintenance are scheduled and performed.

3.3.16 Qualified. A competent and capable person or entity that has met the requirements and training for a given field.

3.3.17 Registered Design Professional (RDP). An individual who is registered or licensed to practice their respective design profession as defined by the statutory requirements of the professional registration laws of the jurisdiction in which the project is to be constructed, or other professional with qualifications or credentials acceptable to the jurisdiction in which the project is to be constructed.

3.3.18* Sequence of Operation. A matrix, narrative, or table of system inputs and outputs or responses that illustrate the interactions of interconnected fire protection systems.

3.3.19 Stakeholder. Any individual, group, or organization that might affect or be affected by the project.

3.3.20 System.

3.3.20.1* ***Active Fire Protection System.*** A system that uses moving mechanical or electrical parts to achieve a fire protection goal.

3.3.20.2 ***Fire Protection Systems.*** Systems, devices, and equipment used to detect a fire and its by-products, actuate an alarm, or suppress or control a fire and its by-products, or any combination thereof. [**1031,** 2014]

3.3.20.3 ***Individual System.*** A system with no interconnections or a system within an integrated system to the point of interconnection or to the interface device.

3.3.20.4* ***Life Safety Systems.*** Systems that enhance or facilitate evacuation, smoke control, compartmentalization, and/or isolation. [**1031,** 2014]

3.3.20.5* ***Passive Fire Protection System.*** Any component of a building or structure that provides protection from fire or smoke without any type of system activation or movement.

3.3.21 System Connection.

3.3.21.1* ***Integrated System.*** A combination of systems that operate together as a whole to achieve the fire protection and life safety objectives.

3.3.21.2* ***Interconnected System.*** An integrated system that has component systems or devices connected to achieve fire protection and life safety objectives.

3.3.21.2.1* ***Data Sharing System.*** A connection between multiple individual systems in which data streams are transferred.

3.3.21.2.2* ***Switch Connection.*** A connection between multiple individual systems using a device for making or breaking the connection in an electrical circuit.

3.3.22 Systems Manual. A compilation of all operational and maintenance manuals and description of the integrated fire protection and life safety systems.

3.3.23 Test. A procedure intended to establish the operational status or performance of a system or component.

3.3.23.1* ***Acceptance Test.*** Test performed on an individual system to verify compliance with approved design documents and to verify installation in accordance with governing laws, regulations, codes, and standards.

3.3.23.2* ***Integrated Test.*** Test performed on fire protection and life safety systems to confirm that operation, interaction, and coordination of multiple individual systems perform their intended function.

3.3.23.3* ***Pre-functional Test.*** Test performed before acceptance testing to confirm compliance with applicable requirements.

Chapter 4 General

4.1 Goals.

4.1.1 The goal of this standard shall be to establish a process that provides documentation that fire protection and life safety features and systems are planned, designed, and constructed as well as perform, in conformity with the owner's project requirements and the basis of design.

4.1.2 The services, products, and deliverables required by this standard shall provide the necessary documentation for the owner to verify the continued performance and operation of these systems.

4.2 Objectives. Commissioning shall achieve the following:

(1) Document and communicate through specifications or work orders the owner's project requirements and the basis of design
(2) Verify and document that all fire protection and life safety equipment and systems have been installed in accordance with the construction documents and applicable codes and standards and perform their function(s) as intended
(3) Verify and document that all fire protection and life safety systems have been completed, inspected, successfully tested, and approved
(4) Verify and document that all integrated system testing for all integrated fire protection and life safety systems has been completed, inspected, successfully tested, and approved
(5) Verify and document that all outstanding fire protection and life safety system deficiencies have been corrected to afford a reasonable degree of safety to the building occupants from fire and similar emergencies
(6) Verify and document delivery of operation and maintenance documentation
(7) Provide and document training requirements for facility operating and maintenance staff
(8) Identify, turnover, and document the requirements for maintaining system performance to meet the original design intent during the occupancy phase

4.3 Qualifications.

4.3.1 Fire Protection and Life Safety Systems Commissioning Team. The members of the fire protection and life safety systems commissioning team shall have the necessary knowledge and experience to complete the commissioning process. *(See Annex B for qualifications.)*

4.3.2 Fire Commissioning Agent.

4.3.2.1* The fire commissioning agent shall be qualified, knowledgeable, and experienced in the proper application of the commissioning requirements of this standard and general industry practices.

4.3.2.2 The fire commissioning agent shall be individually identified on the specifications or other enabling documentation.

4.3.2.3 The fire commissioning agent shall provide an objective and unbiased point of view.

4.4 Commissioning Record.

4.4.1 Documentation.

Δ **4.4.1.1*** Commissioning documents and forms shall be used to record commissioning of fire protection and life safety systems. *(See Annex E.)*

4.4.1.2* Documentation required by approved installation standards referenced in the basis of design shall be provided.

4.4.1.3* Forms and checklists required by installation standards referenced in the basis of design shall be utilized.

4.4.2 Document Retention.

4.4.2.1 The commissioning records shall be given to the owner.

4.4.2.2* The commissioning records shall be retained by the owner for the life of each individual fire protection and life safety system.

4.4.2.3 Where required, documents used to record commissioning of fire protection and life safety systems shall be provided to the authority having jurisdiction and other stakeholders.

Chapter 5 Commissioning

5.1 General.

5.1.1* Process. Commissioning of fire protection and life safety systems shall include, but not be limited to, the planning phase, design phase, construction phase, and occupancy phase. *[See Figure A.5.1.1(a), Figure A.5.1.1(b), and Figure A.5.1.1(c).]*

5.1.2* Owner's Responsibilities.

5.1.2.1* The owner shall be responsible for the commissioning of all fire and life safety systems.

5.1.2.2* The owner shall be permitted to delegate the responsibility for commissioning to a designated representative.

5.1.2.3 The owner or owner's designated representative shall designate the fire commissioning agent.

5.2 Planning Phase.

5.2.1 Owner's Project Requirements.

5.2.1.1* The owner's project requirements shall be the foundation for design, construction, acceptance, and operation of fire protection and life safety systems.

5.2.1.2* Stakeholders shall have input into the development of the owner's project requirements.

5.2.1.3* Performance and acceptance criteria shall be documented in the owner's project requirements.

5.2.2* Commissioning Team.

5.2.2.1* A fire protection and life safety systems commissioning team shall have a fire commissioning agent.

5.2.2.2* The fire commissioning agent shall establish the fire protection and life safety systems commissioning team.

5.2.2.3* The fire protection and life safety systems commissioning team shall include, at a minimum, the owner and the fire commissioning agent.

5.2.3 Commissioning Plan.

5.2.3.1 The commissioning plan shall be updated by the fire protection and life safety systems commissioning team throughout the planning, design, construction, and occupancy phases of the building life cycle.

Δ **5.2.3.2*** The commissioning plan shall contain the following information:

(1) Commissioning scope
(2) General project information
(3) Fire protection and life safety systems commissioning team members, roles, and responsibilities
(4) General communication plan and protocol
(5) Commissioning process tasks and activities through all phases
(6) Commissioning schedule
(7) Commissioning process documentation and deliverables
(8) Testing procedures
(9) Testing of integrated systems where applicable
(10) Recommended training
(11) Frequency established for periodic integrated systems testing where applicable

5.2.3.3 The commissioning plan shall form the commissioning record.

5.3 Design Phase.

5.3.1 Basis of Design. The basis of design shall include the following:

(1)* A description of the building or structure
(2)* A description of fire protection or life safety systems and components
(3)* Performance objectives and criteria
(4)* List of applicable codes and standards
(5)* Alternative means and methods incorporated into the original design
(6) Testing and start-up requirements

5.3.2 Commissioning Team.

5.3.2.1 The commissioning team shall provide guidance to the design team for including the following in the design of active and passive fire protection systems:

(1) That material and equipment installation meets the applicable listing for the products
(2) That material and equipment has the capacity to perform as intended
(3) The appropriateness of the application of fire protection systems
(4) Locations of fire protection systems
(5) Content of owner training

5.3.3 Commissioning Plan. The commissioning plan shall be updated to include the following:

(1) The basis of design
(2) Sequence of operation for fire protection and life safety systems
(3)* Scope of work for commissioning activities
(4) Commissioning procedures
(5) Commissioning schedule coordinated with construction schedule
(6) Commissioning benchmarks or milestones
(7) Identification of qualified specialists, where required, and their responsibilities
(8)* Issues log
(9) Construction checklists

5.4 Construction Phase.

5.4.1 Commissioning Team.

5.4.1.1 The fire protection and life safety systems commissioning team shall perform the following:

(1) Confirm the validity of the commissioning schedule and update as needed to coordinate with the construction schedule
(2) Review submittals, plans, and product data sheets, for conformance to the basis of design
(3) Verify materials, construction, and installation conform to the basis of design
(4) Confirm qualified specialists, where required, perform commissioning activities
(5) Document issues and changes to the project and update the commissioning plan
(6) Review integrated systems design for compatibility or communication problems
(7) Complete commissioning construction checklists
(8) Observe installation and test procedures or verify performance of the responsible party
(9) Document the testing activities
(10) Verify owner training took place

5.4.1.2 Passive fire protection systems shall be inspected or tested for proper installation, including the following:

(1) Conformance to approved drawings and specifications
(2) Installation in accordance with manufacturers' published instructions
(3) Compliance with applicable codes and standards
(4)* Correct performance of operable parts

5.4.1.3 Active fire protection systems shall be inspected and tested for proper installation and operation including completion of acceptance testing and integrated systems testing in compliance with NFPA 4.

5.4.2 Operation and Maintenance Manual.

5.4.2.1* The operation and maintenance manual shall be organized by specification section.

5.4.2.2 The operation and maintenance manual shall contain the following:

(1) Product data sheets
(2) Equipment installation instructions
(3) Equipment operating manuals

5.4.3 Owner Training.

5.4.3.1 Owner training shall include the installed integrated systems, component systems, and devices.

5.4.3.2* Systems training shall be scheduled with or near to final systems acceptance.

5.4.3.3* Training session scope and attendees shall be documented.

5.4.4 Documentation.

5.4.4.1* The commissioning team shall verify the closeout documents are ready to submit to the owner.

5.4.4.2 The commissioning record shall be submitted to the owner.

5.4.5* Turnover.

5.4.5.1 Systems or portions of systems shall be permitted to be tested and accepted at different times during the life of the construction project.

5.4.5.2 Where projects are turned over in stages, the commissioning plan shall incorporate requirements for turning over systems or portions of systems.

5.4.5.3 The requirements of 5.4.1 through 5.4.4 shall apply as each part of a system is tested and accepted.

5.4.5.4 The documentation and commissioning records shall be turned over to the owner in accordance with the commissioning plan.

5.5 Occupancy Phase.

5.5.1 Commissioning Team.

5.5.1.1* The commissioning team shall schedule and observe testing that had been deferred for seasonal conditions.

5.5.1.2 The following additional documentation shall be submitted to the owner:

(1) Recommended predictive maintenance plan
(2) Inspection, test, and maintenance frequencies list

5.5.2 Owner Administrative Controls.

5.5.2.1* The owner shall be responsible for conducting inspection, test, and maintenance as shown in 5.5.1.2(2).

5.5.2.2* The owner shall protect and maintain the commissioning documents.

5.5.3* Training. Facilities personnel or their designated representatives shall receive periodic retraining.

Chapter 6 Commissioning of Existing Fire Protection and Life Safety Systems

6.1 General. Commissioning of existing active and passive fire protection and life safety systems shall meet the requirements of this chapter.

6.2 Re-commissioning.

6.2.1 The provisions of Section 6.2 shall apply to systems that followed the fire protection and life safety systems commissioning process through design, construction, and occupancy phases only where the original owner's project requirements or basis of design documents are available.

6.2.2* Where the original owner's project requirements or basis of design documents are unavailable, the user shall refer to the provisions of this chapter for retro-commissioning.

6.2.3* Re-commissioning shall be performed as specified in the fire protection and life safety systems commissioning plan or upon a change of fire protection and life safety systems affecting the operation of such systems.

6.2.4 Where any of the items listed in 5.2.3 other than the owner's project requirements or basis of design are unavailable, they shall be developed by the fire protection and life safety systems commissioning team utilizing as much historical information as possible with the owner's project requirements and basis of design as the basis for any assumptions.

6.2.5 Re-commissioning shall be in accordance with Section 6.2.

6.2.5.1* A fire protection and life safety systems commissioning team shall be established and responsibilities assigned in accordance with 5.2.2.

6.2.5.2 The original owner's project requirements and basis of design shall be reviewed by the fire protection and life safety systems commissioning team against current facility operational conditions.

6.2.5.3* Where the owner's project requirements or basis of design do not match the current facility operational conditions, the owner's project requirements or basis of design shall be updated to meet current conditions, including any updates to the sequence of operation.

6.2.5.4 The original design and installation drawings shall be reviewed to gain familiarity with the individual systems and overall fire protection and life safety for the facility.

6.2.5.5 The original fire protection and life safety systems commissioning plan shall be reviewed and modified based on any revisions to the owner's project requirements or basis of design.

6.2.5.6 The original construction checklists and functional performance tests shall be reviewed and modified based on any revisions to the owner's project requirements or basis of design.

6.2.5.7* Functional performance testing of the existing fire protection and life safety systems shall be performed as described in the fire protection and life safety systems commissioning plan, including verification of the sequence of operation.

6.2.5.8 The original systems manuals and record drawings shall be reviewed for completeness and quality of materials.

6.2.5.9* Knowledge of the operation and maintenance of fire protection and life safety systems by on-site personnel shall be assessed to determine if additional training is required.

6.2.5.10 A re-commissioning report shall be developed by the fire commissioning agent and forwarded to the owner for review.

6.2.6 The re-commissioning report shall include the following information:

(1) Scope and overview of the re-commissioning process
(2) List of fire protection and life safety systems commissioning team members, including role and contact information
(3) Updated owner's project requirements and basis of design
(4) Updated fire protection and life safety systems commissioning plan, including any revisions to frequency of performing future re-commissioning or integrated systems testing
(5) Updated and completed construction checklists

(6) Updated and completed functional performance test results
(7) Analysis of the existing systems manuals, record drawings, and personnel training
(8) Issues log noting recommendations for corrective action by the owner

6.3 Retro-commissioning.

Δ **6.3.1*** Retro-commissioning shall be necessary only where required by the owner or other governing laws, codes, or standards.

6.3.2* Where required by 6.3.1, the requirements in 6.3.2.1 through 6.3.2.13 shall be achieved during retro-commissioning.

6.3.2.1* A fire protection and life safety systems commissioning team shall be established and responsibilities assigned in accordance with 5.2.2.

6.3.2.2* An owner's project requirements shall be developed by the fire protection and life safety systems commissioning team in consultation with the owner.

6.3.2.3 The owner's project requirements shall meet 5.2.1 as applicable to the existing building.

6.3.2.4* A basis of design shall be developed by the fire protection and life safety systems commissioning team based on available historical information.

6.3.2.5 The basis of design shall meet 5.3.1 as much as applicable to the existing building.

6.3.2.6 Any design or installation drawings shall be reviewed to gain familiarity with the individual systems and overall fire protection and life safety for the facility.

6.3.2.7 A sequence-of-operation matrix shall be developed based on the information provided in the owner's project requirements or basis of design as well as an understanding of the system's current function.

6.3.2.8 A retro-commissioning plan shall be developed following 5.2.3.2 as applicable for the existing systems.

6.3.2.9 Functional performance tests shall be developed based on the current owner's project requirements, basis of design, and sequence-of-operation matrix.

6.3.2.10* Functional performance testing of the existing fire protection and life safety systems shall be performed as described in the retro-commissioning plan, including verification of the sequence of operation.

6.3.2.11 The original systems manuals and record drawings shall be reviewed for completeness and quality of materials.

6.3.2.12* Knowledge of the operation and maintenance of fire protection and life safety systems by on-site personnel shall be assessed to determine if additional training is required.

6.3.2.13 A retro-commissioning report shall be developed by the fire commissioning agent and forwarded to the owner for review to determine if the report is complete and acceptable.

Δ **6.3.3** The retro-commissioning report shall include, at a minimum, the following information:

(1) Scope and overview of the retro-commissioning process
(2) List of fire protection and life safety systems commissioning team members, including role and contact information
(3) Current owner's project requirements, basis of design, and sequence of operation, as developed by the fire protection and life safety systems commissioning team
(4) Retro-commissioning plan, including any frequency of future re-commissioning or integrated systems testing
(5) Completed functional performance test results
(6) Analysis of the existing systems manuals, record drawings, and personnel training
(7) Issues log noting recommendations for corrective action by the owner

Annex A Explanatory Material

Annex A is not a part of the requirements of this NFPA document but is included for informational purposes only. This annex contains explanatory material, numbered to correspond with the applicable text paragraphs.

A.1.1 It is intended that the implementation of the requirements of this standard vary by the type, number, and complexity of systems utilized within a particular building. For example, a hospital or high-rise building would most likely necessitate a strict application of all the requirements of the standard while other structures, with simpler fire protection systems, such as a convenience store or small warehouse would certainly mandate a simpler application. Facilities where this document would be used include hospitals, high-rise buildings, and other structures having complex fire protection and life safety systems. A convenience store or warehouse that only has an automatic fire sprinkler or fire alarm system would not be expected to do commissioning as outlined in this document.

A.1.3 Planning for integrated fire protection and life safety systems commissioning for a building or structure involves a systems approach that enables the designers to analyze all the components and individual systems as a total fire protection and life safety system. This standard should apply to structures such as roadway and transit tunnels, bridges, towers, fuel storage facilities, and other structures. There might also be a need to commission existing systems where not previously commissioned.

A.1.3.2 This standard does not apply except where referenced by other legally adopted governing laws, codes, regulations, or standards. This is not to say that the standard could not be referenced by an owner of a building, or other individuals, who might be involved in the design of a new building, or who recognize the need to commission existing systems where existing systems were not previously commissioned, or which have been modified.

A.1.3.3 Passive and active fire protection and life safety systems include the following:

(1) Infrastructure supporting the fire protection and life safety systems within the boundaries of the project. Project infrastructure should include those systems and utilities necessary for the support and operation of the fire protection and life safety systems of the proposed project, such as the following:
    (a) Access roadways for general ingress and egress and those necessary for fire department access in

accordance with local laws and applicable codes and standards
(b) Public utility systems for the provisions of electric power, fuel gas, water, and waste water; communication systems; and any other utility system deemed essential for the support of project operations
(c) On-site combined heat and power generation systems, electric power generation plants or systems, fuel gas storage facilities, water supply and storage facilities, and environmental or waste management systems
(d) Underground fire protection pipe mains and fire hydrants

(2) Fixed fire suppression and control systems, including special hazard systems.
(3) Fire alarm and signaling systems.
(4) Emergency communications systems.
(5) Smoke control and management systems.
(6) Emergency systems, legally required standby systems, and critical operations power systems, including those powering systems or equipment such as the following:

(a) Smoke control systems
(b) Stair pressurization systems
(c) Smoke-proof enclosure ventilation systems
(d) Electric-driven fire pumps
(e) Fire service access elevators
(f) Occupant evacuation elevators
(g) Fire suppression systems controllers

Emergency power supply systems in large area occupancies, health care facilities, or high-rise buildings, supply power to the electrical systems required for life safety and therefore require commissioning. The emergency power supply systems should be evaluated for their functionality to provide illumination and critical power to serve the needs of those who can physically evacuate a building, including the sustaining of life for those who cannot, whether or not there is a fire event in the building.

(7) Explosion prevention and control systems.
(8) Fire-resistant and smoke-resistant assemblies, such as floor/ceilings and ceiling/roof decks, doors, windows, barriers, fire dampers, smoke dampers and combination smoke/fire dampers, and walls protected by a firestop system or device for through-penetrations and membrane penetrations, and other fire and smoke assemblies.
(9) Firestopping, which includes fire- and smoke-resistant-rated assemblies protected by a firestop system or device for through-penetrations and membrane penetrations.
(10) Systems associated with cooking operations.
(11) Elevator systems.
(12) Means of egress systems and components, including the following:

(a) Emergency lighting and exit signs
(b) Major egress components, such as corridors, stairs, ramps, and so forth
(c) Exit path marking systems
(d) Fire barrier components for horizontal exits

(13) Other systems or installations integrated or connected to a fire or life safety system such as access control, critical processes, and hazardous operations.

In manufacturing and industrial complexes, commissioning could be required to ascertain and document that interconnections with machinery or parts of the process function as planned by the owner's project requirements and basis of design. This could necessitate or induce partial or full interruption of the industrial process. An example would be the automatic shutdown of conveyors in the case of a sprinkler activation. The automatic shutdown feature is part of the commissioning process.

A.3.2.1 Approved. The National Fire Protection Association does not approve, inspect, or certify any installations, procedures, equipment, or materials; nor does it approve or evaluate testing laboratories. In determining the acceptability of installations, procedures, equipment, or materials, the authority having jurisdiction may base acceptance on compliance with NFPA or other appropriate standards. In the absence of such standards, said authority may require evidence of proper installation, procedure, or use. The authority having jurisdiction may also refer to the listings or labeling practices of an organization that is concerned with product evaluations and is thus in a position to determine compliance with appropriate standards for the current production of listed items.

A.3.2.2 Authority Having Jurisdiction (AHJ). The phrase "authority having jurisdiction," or its acronym AHJ, is used in NFPA documents in a broad manner, since jurisdictions and approval agencies vary, as do their responsibilities. Where public safety is primary, the authority having jurisdiction may be a federal, state, local, or other regional department or individual such as a fire chief; fire marshal; chief of a fire prevention bureau, labor department, or health department; building official; electrical inspector; or others having statutory authority. For insurance purposes, an insurance inspection department, rating bureau, or other insurance company representative may be the authority having jurisdiction. In many circumstances, the property owner or his or her designated agent assumes the role of the authority having jurisdiction; at government installations, the commanding officer or departmental official may be the authority having jurisdiction.

A.3.2.3 Listed. The means for identifying listed equipment may vary for each organization concerned with product evaluation; some organizations do not recognize equipment as listed unless it is also labeled. The authority having jurisdiction should utilize the system employed by the listing organization to identify a listed product.

A.3.3.2 Building. The term *building* should be understood as if followed by the words "or portions thereof."

Δ **A.3.3.3.2 Commissioning Authority (CxA).** A commissioning authority is typically provided and leads the overall fire protection and life safety systems commissioning team when the commissioning process is applied to more than one building system — that is, building commissioning. When the commissioning process is applied only to fire and life safety systems, the fire commissioning agent can assume the role of the commissioning authority, or vice versa.

A.3.3.3.3 Commissioning Plan. The commissioning plan establishes the framework for how commissioning will be handled and managed on a given project.

A.3.3.3.6 Fire Protection and Life Safety Systems Commissioning (Cx). Commissioning is achieved in the design phase by documenting the design intent and continuing throughout construction, acceptance, and the warranty period with actual

verification of performance, operation and maintenance manual documentation verification, and the training of operating personnel.

A.3.3.3.7 Fire Protection and Life Safety Systems Commissioning Team. The fire protection and life safety systems commissioning team can be part of a larger building commissioning team with team members whose focus is on commissioning electrical, mechanical, plumbing, and electronics systems. The overall team can be led by a commissioning authority whose responsibility is defined in ASHRAE Guideline 0, *The Commissioning Process*. Roles and responsibilities of members of the fire protection and life safety systems commissioning team are described in Annex C.

A.3.3.3.8 Re-commissioning (Re-Cx). Re-commissioning can be initiated periodically or in response to a building renovation or change in building use. Re-commissioning is simply a full or partial repeat of the commissioning process that was performed prior to building occupancy. The purpose of re-commissioning is to verify that the systems still function according to the original owner's project requirements and basis of design, as well as governing laws, regulations, codes, and standards that were in effect at the time of initial installation, unless changes to the building have occurred that would require changes to the owner's project requirements and basis of design.

A.3.3.3.9 Retro-commissioning (Retro-Cx). Retro-commissioning is a process that ensures building systems perform interactively according to the design intent or to meet the owner's current operational needs, and are in compliance with governing laws, regulations, codes, and standards that were in effect at the time that the systems were originally installed.

This is achieved by researching and documenting the original owner's project requirements and basis of design, and regulations in effect at the time of installation, to the best extent practical as well as the current operational needs. Once the owner's project requirements and basis of design have been developed, based on either assumptions of the original design or current operational needs, the fire protection and life safety systems would follow an abbreviated commissioning process. The abbreviation mainly deals with the operations normally realized during the planning phase and the construction phase that will not be undertaken under retro-commissioning.

A.3.3.9 Installation Contractor. Installation contractors often provide shop drawings, working plans, and other related documents. In some cases an installation contractor might provide labor only, with the owner or general contractor providing the materials or equipment.

A.3.3.12 Narrative. The narrative is written to assist and expedite the plan review and inspection process by the authority having jurisdiction. For some buildings and systems, the narrative could be relatively simple or for complex systems quite extensive. In all cases, it should be written in a way that is easy to understand and follow. It is maintained on file for use at the time of final inspection and for periodic reviews during future field inspections. It is referenced by the building owner and authority having jurisdiction to ensure that all future modifications, alterations, additions, or deletions to the original systems are current and that the original system's protection and required system performance are not compromised or have not been altered without building or fire official prior review. The narrative should be recognized by all entities as one of the key documents associated with the commissioning process.

Building owners benefit by knowing how their buildings' fire protection and life safety systems work. The narrative provides a procedure, including methods for testing and maintenance. A copy of the narrative report should be kept on the premises and should be available for review before testing and proposed modifications to any portion of the building's fire protection and life safety systems.

Development Format. The narrative is prepared by a qualified, identified individual who is in charge of the development of an entire coordinated narrative that includes all information regarding the design basis, sequence of operation, and testing criteria associated with all required or nonrequired fire protection and life safety systems set forth by applicable codes, and standards, and local laws, and ordinances of the jurisdiction. The level of qualification for the individual narrative depends on the complexity of the systems or building. For less complex systems, the preparer could be an alarm, suppression, or other design technician. For more complex systems, the needed expertise might require that of an experienced consultant or engineer.

The narrative should be submitted with plans and specifications for review and approval by the authority having jurisdiction before the issuance of a building permit. The narrative should be written in a clear conversational format. The construction specifications should not be considered a narrative; however, some applicable portions of the construction specifications could be included to support or clarify the intent of the narrative. The narrative is a stand-alone document; it should be 8½ in. × 11 in. for filing and ease of use by the authority having jurisdiction and building owners, and it should include an administrative cover page identifying the project name, building address, and name, address, and phone number of the individual who is in charge of the preparation of the narrative.

Commentary. Codes and standards are written in a way to require uniformity in design and construction for all buildings and structures. The codes and standards can be subjective and are subject to interpretation by building owners, designers, and the authority having jurisdiction; uniformity is not always necessarily achieved. The narrative should attempt to clarify to the authority having jurisdiction the designer's intent and interpretation of the codes and standards. The narrative should be a valuable instrument when accurately prepared, and it will establish a line of communication between the designer and the authority having jurisdiction, resulting in what the building codes and standards mandate. The narrative should be written in a three-section format with subsections as necessary (e.g., methodology, sequence of operation, and testing criteria sections) for clarity and should be limited to a summary. A sample narrative outline can be found in Annex D.

A.3.3.18 Sequence of Operation. See Figure A.3.3.18(a) and Figure A.3.3.18(b). The matrix and the sequence of operations form are examples only, and they might need to be modified based on the actual installation requirements. The system outputs on the sequence of operations matrix correspond to the system outputs on the sequence of operation form.

A.3.3.20.1 Active Fire Protection System. Examples of active systems include gaseous extinguishing systems, sprinklers, standpipes, dampers, or fire alarm systems.

System Inputs			System Outputs																							
			Fire Alarm Control Center									Notification		Other Required Fire Safety												
			Actuate common alarm signal indicator	Actuate audible alarm signal	Actuate common supervisory signal indicator	Actuate audible supervisory signal	Actuate common trouble signal indicator	Actuate audible trouble signal	Display and print change of status and time of initiating event	Transmit alarm to fire department and to central station — masterbox	Illuminate associated detector LED indicator	Actuate associated exterior fire alarm beacon(s)	Actuate all evacuation signals for the building	Release all magnetically held doors	Recall associated elevator in accordance with recall sequence (see Note 2)	Shut down associated mechanical equipment (see Note 3)	Release preaction valve (charge sprinklers)	Elevator hoistway vent open									
			A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P								
Fire Alarm System	Fire Alarm Inputs	1	Typical manual pull station (by device) — levels 1–5	X	X					X	X		X	X	X					1					
		2	Typical elevator recall smoke detector (by device) — by floor (lobby)	X	X					X	X		X	X	X	X			X	2					
		3	Elevator machine room smoke detector	X	X					X	X	X	X	X	X				X	3					
		4	Typical smoke detector (by device) — computer room (third floor) — preaction system	X	X					X	X		X	X	X					4					
		5	Typical wet sprinkler system flow control valve assembly flow switch — by floor	X	X				X		X	X	X	X	X					5					
		6	Typical wet sprinkler system flow control valve assembly tamper switch — by floor			X	X			X										6					
		7	Typical preaction sprinkler system flow control valve assembly flow switch — by floor	X	X				X	X	X			X	X					7					
		8	Typical preaction sprinkler system flow control valve assembly tamper switch — by floor			X	X			X										8					
		9	Kitchen cafeteria hood and duct extinguishing system — first floor	X	X					X	X				X				X	9					
		10	Typical duct-in smoke detector (by device) — by floor							X							X			10					
Building		11	Fire pump running			X	X			X										11					
		12	Fire pump power failure			X	X			X										12					
		13	Fire pump phase reversal			X	X			X										13					
		14	Fire pump connected to emergency power			X	X			X										14					
		15	Fire pump circuit breaker at generator output			X	X			X										15					
FACP		16	Fire alarm system open circuit					X	X	X										16					
		17	Fire alarm system ground fault					X	X	X										17					
		18	Fire alarm system battery disconnect					X	X	X										18					
		19	Fire alarm system low battery					X	X	X										19					
Misc.		20	Fire alarm system ac power failure					X	X	X										20					
		21	Fire alarm system amplifier failure					X	X	X										21					
		22	Generator status indicator					X	X											22					
				A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P							

Notes:
1. Five-story office building, use Group B. Cafeteria (use Group A) on first floor equipped with a hood and duct extinguishing system. Computer room on third floor equipped with a preaction system.
2. Upon activation of elevator recall the elevator should stop at primary recall floor. If fire is on primary recall floor the elevator should stop at an alternate recall floor. Primary and alternate recall floor should be coordinated with the fire department.
3. Shutdown of mechanical equipment should be interfaced with building automation system.

FIGURE A.3.3.18(a) Sequence of Operation.

SEQUENCE OF OPERATION TEST FORM

Building Information

Building name: _____

Building address: _____

Owner's name: _____

Owners address: _____

Owner's phone/fax/e-mail: _____

Installing Contractor

Company name: _____

Address: _____

Contact person: _____

Phone/fax/e-mail: _____

System Input	System Output	Test Results	Date	Initials
1. Typical manual pull station (by device) floors 1–5	A. Actuate common alarm signal indicator			
	B. Actuate audible alarm signal			
	G. Display and print change of status and time of initiating event			
	H. Transmit alarm to FD and central station masterbox			
	J. Actuate associated exterior fire alarm beacons			
	K. Actuate all evacuation signals for the building			
	L. Release all magnetically held doors			
2. Typical elevator recall smoke detector (by device) by floor (lobby)	A. Actuate common alarm signal indicator			
	B. Actuate audible alarm signal			
	G. Display and print change of status and time of initiating event			
	H. Transmit alarm to FD and central station masterbox			
	J. Actuate associated exterior fire alarm beacons			
	K. Actuate all evacuation signals for the building			
	L. Release all magnetically held doors			
	M. Recall associated elevator in accordance with recall sequence			
	P. Elevator hoistway open			
3. Elevator machine room smoke detector	A. Actuate common alarm signal indicator			
	B. Actuate audible alarm signal			
	G. Display and print change of status and time of initiating event			
	H. Transmit alarm to FD and central station masterbox			
	I. Illuminate associated detector LED indicator			

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Δ **FIGURE A.3.3.18(b) Sequence of Operation Form.**

SEQUENCE OF OPERATION TEST FORM *(continued)*

System Input	System Output	Test Results	Date	Initials
3. Elevator machine room smoke detector *(continued)*	J. Actuate associated exterior fire alarm beacons			
	K. Actuate all evacuation signals for the building			
	L. Release all magnetically held doors			
	P. Elevator hoistway open			
4. Typical smoke detector (by device) computer room (3rd floor) preaction system	A. Actuate common alarm signal indicator			
	B. Actuate audible alarm signal			
	G. Display and print change of status and time of initiating event			
	H. Transmit alarm to FD and central station masterbox			
	J. Actuate associated exterior fire alarm beacons			
	K. Actuate all evacuation signals for the building			
	L. Release all magnetically held doors			
	M. Recall associated elevator in accordance with recall sequence			
5. Typical wet sprinkler system flow control valve assembly flow switch — by floor	A. Actuate common alarm signal indicator			
	B. Actuate audible alarm signal			
	F. Actuate audible trouble signal			
	G. Display and print change of status and time of initiating event			
	H. Transmit alarm to FD and central station masterbox			
	J. Actuate associated exterior fire alarm beacons			
	K. Actuate all evacuation signals for the building			
	L. Release all magnetically held doors			
6. Typical wet sprinkler system flow control valve assembly tamper switch — by floor	C. Actuate common supervisory signal indicator			
	D. Actuate audible supervisory signal			
	G. Display and print change of status and time of initiating event			
7. Typical preaction sprinkler system flow control valve assembly flow switch — by floor	A. Actuate common alarm signal indicator			
	B. Actuate audible alarm signal			
	F. Actuate audible trouble signal			
	G. Display and print change of status and time of initiating event			
	H. Transmit alarm to FD and central station masterbox			
	K. Actuate all evacuation signals for the building			
	L. Release all magnetically held doors			
8. Typical preaction sprinkler system flow control valve assembly tamper switch — by floor	C. Actuate common supervisory signal indicator			
	D. Actuate audible supervisory signal			
	G. Display and print change of status and time of initiating event			

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Δ FIGURE A.3.3.18(b) ***Continued***

SEQUENCE OF OPERATION TEST FORM *(continued)*

System Input	System Output	Test Results	Date	Initials
9. Kitchen cafeteria hood and duct extinguishing system — 1st floor	A. Actuate common alarm signal indicator			
	B. Actuate audible alarm signal			
	G. Display and print change of status and time of initiating event			
	H. Transmit alarm to FD and central station masterbox			
	L. Release all magnetically held doors			
	P. Elevator hoistway open			
10. Typical duct smoke detector (by device) — by floor	G. Display and print change of status and time of initiating event			
	N. Shutdown associated mechanical equipment			
11. Fire pump running	C. Actuate common supervisory signal indicator			
	D. Actuate audible supervisory signal			
	G. Display and print change of status and time of initiating event			
12. Fire pump power failure	C. Actuate common supervisory signal indicator			
	D. Actuate audible supervisory signal			
	G. Display and print change of status and time of initiating event			
13. Fire pump phase reversal	C. Actuate common supervisory signal indicator			
	D. Actuate audible supervisory signal			
	G. Display and print change of status and time of initiating event			
14. Fire pump connected to emergency power	C. Actuate common supervisory signal indicator			
	D. Actuate audible supervisory signal			
	G. Display and print change of status and time of initiating event			
15. Fire pump circuit breaker at generator output	C. Actuate common supervisory signal indicator			
	D. Actuate audible supervisory signal			
	G. Display and print change of status and time of initiating event			
16. Fire alarm system open circuit	E. Actuate common trouble signal indicator			
	F. Actuate audible trouble signal			
	G. Display and print change of status and time of initiating event			
17. Fire alarm system ground fault	E. Actuate common trouble signal indicator			
	F. Actuate audible trouble signal			
	G. Display and print change of status and time of initiating event			

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Δ FIGURE A.3.3.18(b) ***Continued***

SEQUENCE OF OPERATION TEST FORM *(continued)*

System Input	System Output	Test Results	Date	Initials
18. Fire alarm system battery disconnect	E. Actuate common trouble signal indicator			
	F. Actuate audible trouble signal			
	G. Display and print change of status and time of initiating event			
19. Fire alarm system low battery	E. Actuate common trouble signal indicator			
	F. Actuate audible trouble signal			
	G. Display and print change of status and time of initiating event			
20. Fire alarm system ac power failure	E. Actuate common trouble signal indicator			
	F. Actuate audible trouble signal			
	G. Display and print change of status and time of initiating event			
21. Fire alarm system amplifier failure	E. Actuate common trouble signal indicator			
	F. Actuate audible trouble signal			
	G. Display and print change of status and time of initiating event			
22. Generator status indicator	E. Actuate common trouble signal indicator			
	F. Actuate audible trouble signal			

Date system left in service: _____

Test Witnessed by

_____ _____ _____
Owner/authorized agent Title Date

_____ _____ _____
Owner/authorized agent Title Date

Additional explanations/notes: _____

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Δ **FIGURE A.3.3.18(b)** ***Continued***

Δ **A.3.3.20.4 Life Safety Systems.** Life safety systems can include both active and passive fire protection systems, devices, or assemblies. These systems comprise several items of equipment, processes, actions, or behaviors, grouped or interconnected to reduce injuries or death from fire or other life-threatening event.

A.3.3.20.5 Passive Fire Protection System. Examples of passive systems include floor-ceilings and roof, door, window, and wall assemblies, spray-applied fire-resistant materials, and other fire and smoke control assemblies. Passive fire protection systems can include active components and can be impacted by active systems, such as fire dampers.

A.3.3.21.1 Integrated Systems. An integrated system contains systems that are physically connected and others that are not. An integrated system can contain a combination of fire protection and life safety systems and non–fire protection and life safety systems (i.e., building systems such as elevators, heating, ventilating, and air conditioning systems, and automatic door closures) that might or might not be physically connected, but that are required to operate together as a whole to achieve overall fire protection and life safety objectives.

For example, a smoke control system is often activated by water flow in a sprinkler system, but the sprinkler system is not physically connected to the heating, ventilating, and air conditioning system. The physical connection is from the sprinkler system to the fire alarm system and then to the building automation system. Further examples of integrated systems include the need for wall integrity when using total flooding suppression agents or automatic door closers that are to close upon activation of smoke control systems or stair pressurization systems. See Figure A.3.3.21.1 for examples of integrated systems.

A.3.3.21.2 Interconnected System. Interconnections could consist of electrical binary connections or data transfer protocols. Examples of data transfers are BACnet or other data exchange protocols.

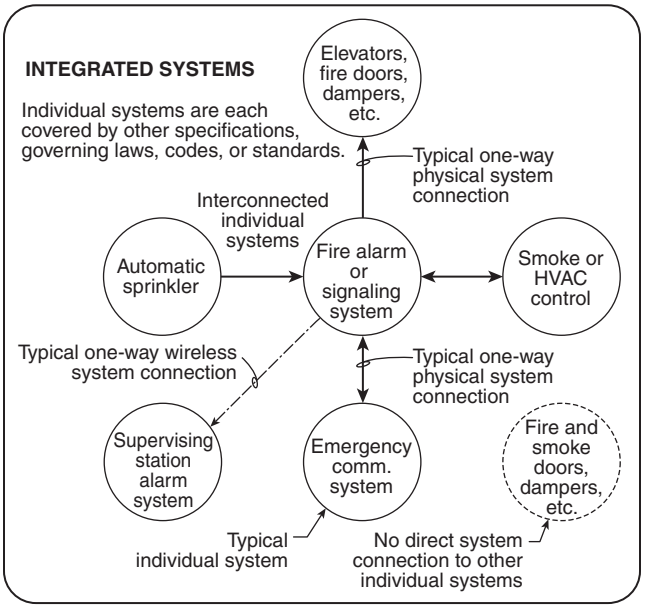


FIGURE A.3.3.21.1 Integrated Systems.

A.3.3.21.2.1 Data Sharing System. Data sharing systems are connected such that data from one component system is shared with other component systems, which then make independent decisions to achieve a desired result. The communication can be one-way or two-way, serial or parallel. A data sharing system can have components that are switch connections too.

A.3.3.21.2.2 Switch Connection. For purposes of this definition, a relay is an electrically controlled switch. An example of a monitored switch is a waterflow switch that is either open or closed (normal/not-normal output), which when connected to the input of a fire alarm system can cause multiple outputs in the fire alarm system, including sounding the waterflow bell and notification appliances, starting smoke control systems, and so forth. An example of a relay as a switch connection is for elevator control: when a fire alarm relay controls when the firefighters' recall occurs through the elevator control monitoring the status of the fire alarm relay.

A.3.3.23.1 Acceptance Tests. Many of the tests are performed on a completed system, or portion thereof, while some tests are performed at various stages of the construction process.

A.3.3.23.2 Integrated System Test. Integrated system testing can include other individual building systems integrated to fire and life safety systems, such as elevator recall or heating, venting, and air conditioning control.

A.3.3.23.3 Pre-functional Test. A pre-functional test is conducted in preparation for other types of testing, including acceptance testing and integrated systems testing. This testing is typically conducted according to a checklist developed by the fire commissioning agent that incorporates manufacturers' requirements and ensures that equipment and components are functioning as intended prior to final acceptance testing. These tests can be complete or partial. In many cases, such as with fire pumps per NFPA 20 and *NFPA 72*, this is required prior to acceptance testing, as the coordination of attendance by multiple members of the commissioning team might be required. Pre-functional testing is synonymous with the term *preliminary testing*.

A.4.3.2.1 The fire commissioning agent should have no financial interest (e.g., owner, division or subsidiary, partner, operating officer, distributor, salesman, or technical representative) in any fire protection or life safety equipment incorporated with the integrated system(s). This would also include manufacturers, suppliers, or installers for any such equipment provided as part of the project. As such, qualified independent third-party firms or individuals should be considered for designation as the fire commissioning agent. The fire commissioning agent should have experience in facility construction, inspection, acceptance testing, or commissioning as it relates to fire protection and life safety.

Personnel qualified to provide fire commissioning agent services include the following individuals:

(1) Registered or licensed professional fire protection engineers with sufficient knowledge of the applicable fire protection or life safety systems included as part of the commissioning process
(2) Registered professional engineers in other disciplines with sufficient knowledge of the applicable fire protection or life safety systems included as part of the commissioning process
(3) Individuals with sufficient knowledge of the design, operation, installation, inspection, or testing of the type of fire

and life safety systems included as part of the commissioning process
(4) Third-party firms with sufficient knowledge of the applicable fire protection or life safety systems included as part of the commissioning process

N **A.4.4.1.1** Commissioning documents and forms should be modified based on the level of complexity of the systems included in the commissioning process.

A.4.4.1.2 Many NFPA and other approved installation standards have both required and recommended documentation. Where the standard requires specific documentation, such documentation should be included in the commissioning documentation. Where there is no specific documentation required by the standard, the basis of design should include a sample or description of the documentation desired.

A.4.4.1.3 Many NFPA and other approved installation standards have both required and recommended forms. Where the standard requires a specific form be used, such as the Contractor's Material and Test Certificate for Aboveground Piping found in NFPA 13, that form should be included in the commissioning documentation. Where no form or checklist exists, specific forms or checklists should be developed by the fire commissioning agent or approved by the commissioning team to document successful testing of fire protection and life safety systems and components.

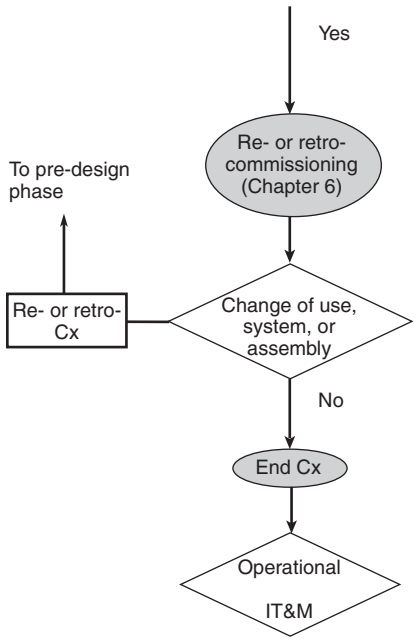
A.4.4.2.2 The commissioning records can be maintained at the site or electronically for ease of access. The owner should be knowledgeable of the storage method and location of the records.

A.5.1.1 Figure A.5.1.1(a), Figure A.5.1.1(b), and Figure A.5.1.1(c) are offered to provide an example of how to perform a commissioning plan.

The fire protection and life safety systems commissioning team should meet with the owner and authority having jurisdiction to determine the systems that should be subject to commissioning or testing of integrated systems. Commissioning and testing of integrated systems might not be required for all facilities, systems, or components. However, where practical, commissioning and testing of integrated fire protection and life safety systems should be performed in accordance with NFPA 3 and NFPA 4, respectively. This would provide a reasonable degree of assurance that these systems operate as designed. For examples of roles and responsibilities, see Table A.5.1.1.

A.5.1.2 The owner's responsibilities should include, but not be limited to, the following:

(1) Contracting and delegating the commissioning process
(2) Assisting in the development of and approval of the owner's project requirements
(3) Assigning operations and maintenance personnel to participate in the commissioning process
(4) Reviewing and accepting any changes to the owner's project requirements
(5) Reviewing and accepting the construction documents
(6) Reviewing and accepting commissioning process progress reports
(7) Reviewing and accepting the commissioning team progress reports
(8) Reviewing and accepting the final commissioning report



Δ **FIGURE A.5.1.1(c) The Commissioning Process — Ongoing Commissioning.**

A.5.1.2.1 Commissioning might not be required for all facilities, systems, or components. However, integrated systems testing should still be performed. A reasonable degree of assurance that the systems will operate as designed can be provided by testing small systems or those integrated systems having simple logic. The owner should review with the fire protection and life safety systems commissioning team and authority having jurisdiction to determine the systems that should be subject to commissioning.

A.5.1.2.2 Examples of a designated representative include the occupant, management firm, or managing individual. Delegation can be through specific provisions in a lease, written use agreement, or management contract.

A.5.2.1.1 The owner's project requirements should include, but not be limited to, the following:

(1) Infrastructure requirements (e.g., utilities, roads, site access)
(2) Facility type, size, height
(3) Intended use
(4) Occupancy classification, number of occupants, number and hours of operation
(5) Future expansion requirements
(6) Applicable codes and standards
(7) Specific user requirements
(8) Training requirements
(9) Warranty, operations, and maintenance requirements
(10) Integrated system requirements in accordance NFPA 4
(11) Specific performance criteria
(12) Third-party requirements

A.5.2.1.2 Owner's project requirements development should include the authority having jurisdiction to provide input regarding issues of fire department operations and access to the site and facility. Other appropriate issues for review might include emergency medical response and police issues.

Table A.5.1.1 Roles and Responsibility Matrix

	Owner	Facility Manager or Operations Personnel	Insurance Rep	Owner Technical Support	Construction Manager	Installation Contractor	Cx Agent	RDP
Planning Stage								
Identify commissioning team	L/A	S	S	P/S	—	—	—	—
Develop owner's project requirements	L/A	S	S	S	—	—	—	—
Develop preliminary commissioning scope	L	S	S	P/S	—	—	—	—
Develop preliminary commissioning plan	L	S	S	S	—	—	—	—
Establish budget for all Cx work and integrate costs for commissioning into project budget	L	S	—	S	—	—	—	—
Include time for Cx in initial project schedule	L	I	I	I	—	—	—	—
Include Cx responsibilities in architect/engineer and construction manager scope of services	L/A	S	—	S	—	—	—	—
Design Stage								
Contract for commissioning agent services	L/A	P	—	P	L	—	—	—
Hold design stage Cx meetings	P	P	P	P	P	—	L	P
Identify project-specific responsibilities	L	L	—	S	S	—	P	P
Review owner's project requirements documentation for completeness and clarity	S	S	I	—	I	—	L	I
Develop basis of design	A	P	P	S/A	I	—	I	L
Perform focused Cx reviews of design drawings and specifications	P	P	P	P	S	—	L	S
Perform project constructability reviews	P	—	—	I/P	L	—	I/S	S
Incorporate appropriate changes to construction documents based upon design reviews	A	P	—	I	I	—	I	L
Refine owner's project requirements based upon design stage decisions	A	P	—	S	I	—	L	S
Create Cx specifications including testing protocols for all commissioned equipment systems	I	I	I	P/S	S	—	L	S
Integrate Cx activities into project schedule	A	I	—	I	L	—	S	I

(continues)

Table A.5.1.1 *Continued*

	Owner	Facility Manager or Operations Personnel	Insurance Rep	Owner Technical Support	Construction Manager	Installation Contractor	Cx Agent	RDP
Coordinate integration issues and responsibilities between equipment, systems, and disciplines	A	I	—	P/S	S	—	V	L
Update commissioning plan	A	I	I	I	S	—	L	I
Incorporate commissioning requirements into construction contractor's scope of work	A	—	—	I	L	—	S	S
Construction Stage								
Revise commissioning plan as necessary	A	I	—	I	I	S	I	L
Review submittals applicable to equipment/systems being commissioned	I	—	A	P	A	S	S	L
Review project submittals for construction quality control and specification conformance	I	—	—	I/P	A	L	S	V
Develop functional test procedures and documentation formats for all commissioned equipment and assemblies	A	I	I	S/A	S	S	I	L
Include Cx requirements and activities in each purchase order and subcontract written	A	—	—	—	—	A	L	V
Develop construction checklists for equipment/systems to be commissioned	A	—	—	P	I	I	I	L
Install components and systems	I	I	—	—	A	A	L	V
Review requests for information and changes for impacts on Cx	A	I	—	I/S	S	L	S	V
Demonstrate operation of systems	I	—	P/I	—	I	P	L	V
Complete construction checklists as the work is accomplished	I	I	—	I	I	S	L	A
Continuously maintain the record drawings and submit as detailed in the construction documents	A	S	—	—	I	S	L	V
Coordinate functional testing for all commissioned systems and assemblies	I	I	—	P/A	I	S	S	L/A
Perform quality control inspections	I	—	I	I/P	—	L	S	P/I

(continues)

Table A.5.1.1 *Continued*

	Owner	Facility Manager or Operations Personnel	Insurance Rep	Owner Technical Support	Construction Manager	Installation Contractor	Cx Agent	RDP
Maintain record of functional testing	I	I	I	I/P	I	S	S	L
Prepare Cx progress reports	A	I	—	I/P	I	P	S	L
Hold construction phase Cx meetings	P	P	P	P	P	P	P	L
Maintain master issues log	I	I	—	I	I	S	I	L
Review equipment warranties to ensure owner responsibilities are clearly defined	I	I	—	—	—	S	S	L
Implement training program for operating personnel	I	P	P	I/S	P	S	S	L
Compile and deliver turnover package	A	A	—	—	S	S	L	S/V
Deliver commissioning record	A	P	—	I	S	S	S	L
Occupancy Stage								
Coordinate and supervise deficiency corrections	A	P	—	I	I/S	L	S	I
Coordinate and supervise deferred and seasonal testing	A	P	—	I	—	S	—	I
Review and address outstanding issues	A	P	I	I	I/S	S	S	I
Review current building operation at 10 months into 12-month warranty period	A	P	I	I	S	S	—	I
Address concerns with operating facility as intended	A	P	I	I	S	S	S	S
Complete final commissioning report	A	P	—	—	I/P	I	—	I
Perform final satisfaction review with customer agency 12 months after occupancy	A	S	I	S	—	S	—	S

L: Lead. P: Participate. S: Support. I: Inform. A: Accept. V: Verify.

Note: The following definitions apply to Table A.5.1.1:

Lead (L) = Direct and take overall responsibility for accomplishment
Support (S) = Provide assistance
Accept (A) = Formally accept either in writing or verbal communication depending on the situation
Participate (P) = Take part in the activity (e.g., attend meetings)
Inform (I) = Make the party aware of the activity or result or provide a copy of the deliverable
Verify (V) = Confirm the accuracy or completeness of the task

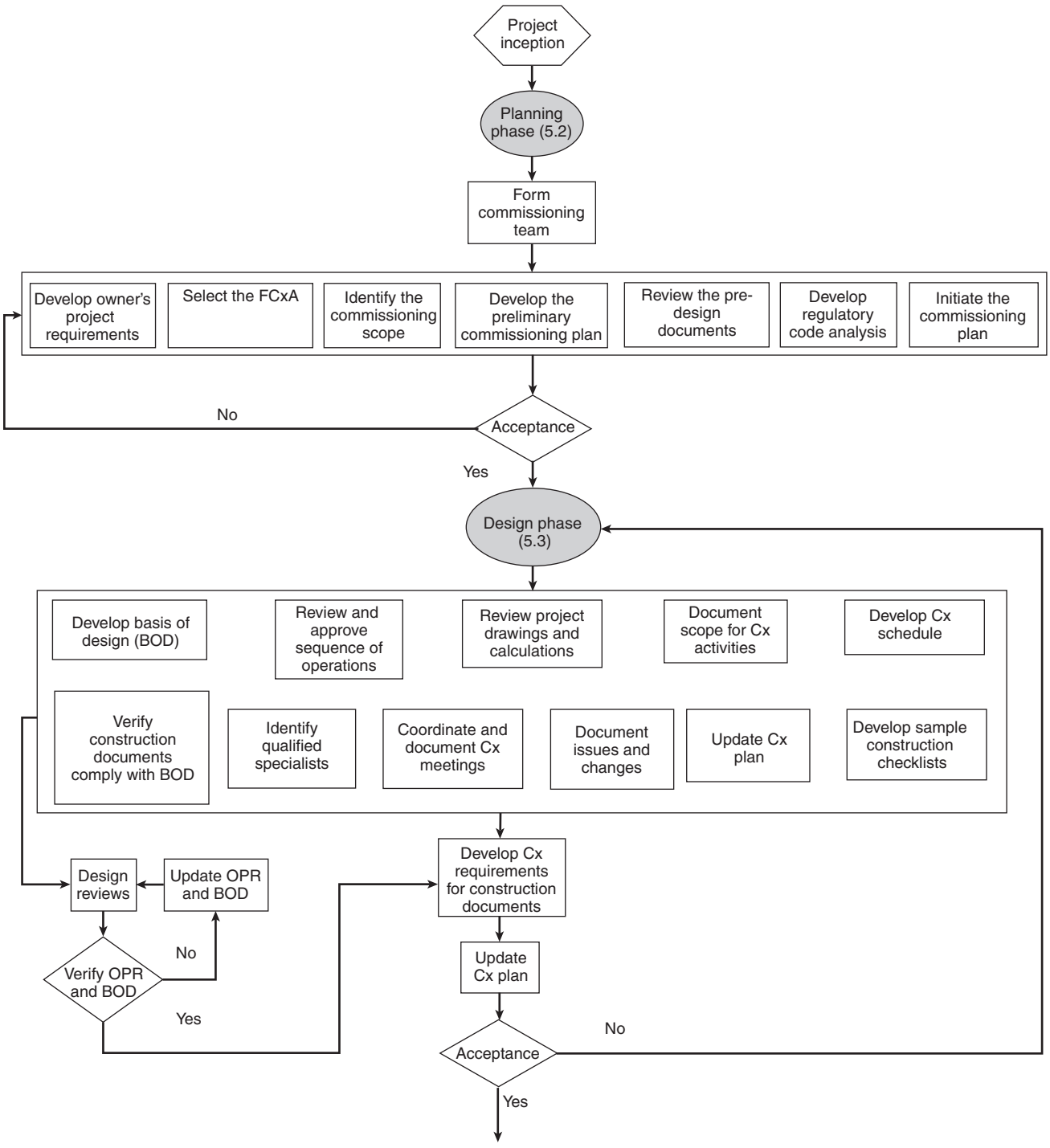
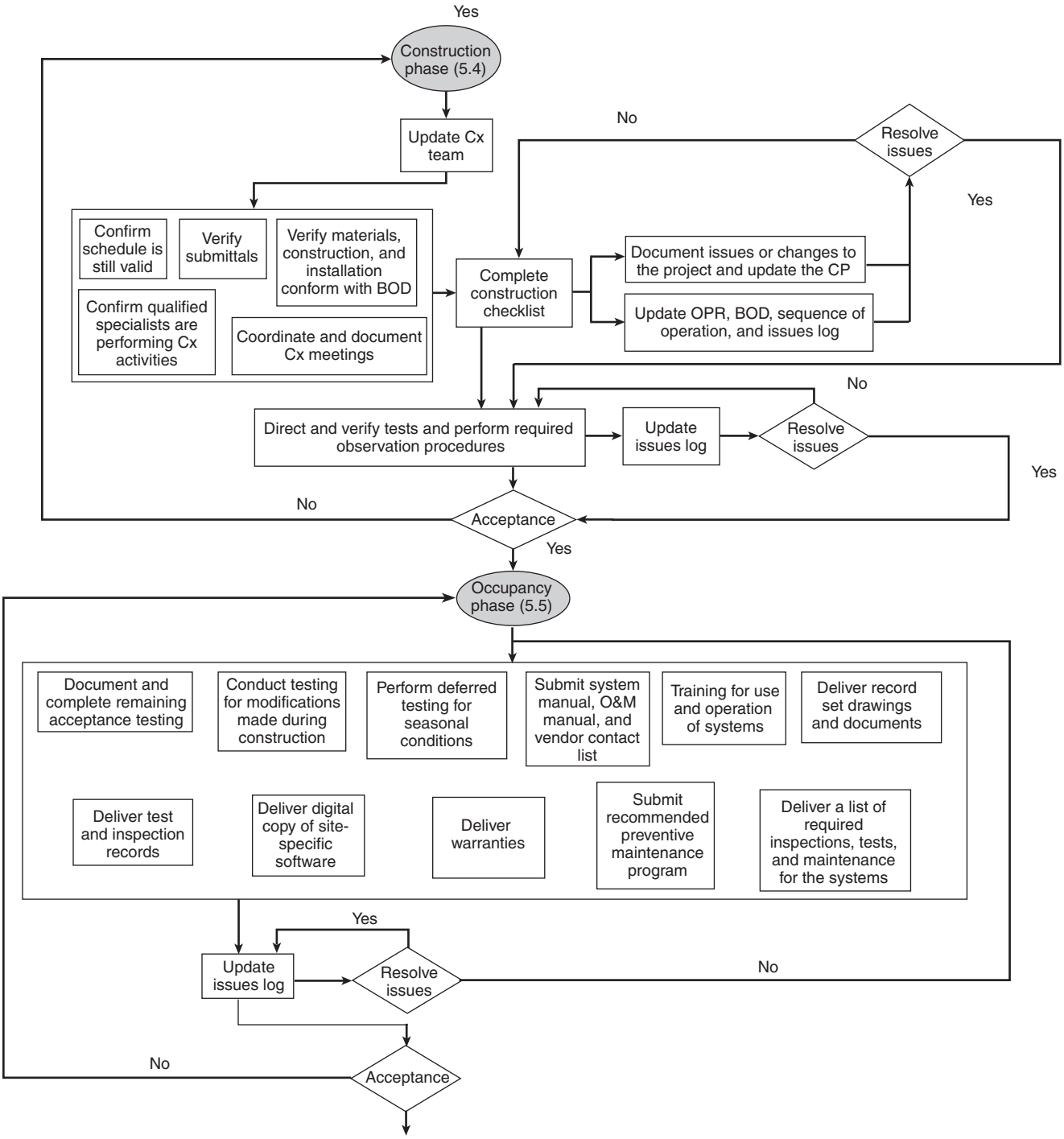


FIGURE A.5.1.1(a) The Commissioning Process — Design Phase.



Δ FIGURE A.5.1.1(b) The Commissioning Process — Construction and Occupancy Phase.

A.5.2.1.3 The owner's project requirements should include the following sections:

(1) Introduction
(2) Owner's key project requirements (i.e., insurance underwriter's standards)
(3) General project description
(4) Project objectives
(5) Functional uses
(6) Occupancy requirements
(7) Budget considerations and limitations
(8) Performance criteria
(9) Project history

The fire and life safety system owner's project requirements can be a section of the overall building commissioning documentation. The owner's project requirements are intended to be a living document that is regularly updated and modified. During the design phase, the owner's project requirements can change significantly based on the needs of the proposed design.

A.5.2.2 The fire protection and life safety systems commissioning team can be part of a larger building commissioning team with team members whose focus is on commissioning electrical, mechanical, plumbing, and electronics systems. The overall team can be led by a commissioning authority whose responsibility is defined in ASHRAE Guideline 0, *The Commissioning Process*. If an entity is not part of the project, it is not the intent of this standard to require those entities to become part of the project fire protection and life safety systems commissioning team. The number of members of the fire protection and life safety systems commissioning team should be determined by project type, size, and complexity.

A.5.2.2.1 The fire commissioning agent's responsibilities should include, but not be limited to, the following:

(1) Organize and lead the fire protection and life safety systems commissioning team
(2) Coordinate and attend fire protection and life safety systems commissioning team meetings
(3) Facilitate the development of and document the owner's project requirements
(4) Verify that commissioning process activities are clearly stated in all scopes of work
(5) Identify and integrate the commissioning process activities into the project schedule
(6) Prepare the commissioning plan
(7) Prepare the commissioning process activities to be included in the project specification
(8) Execute the commissioning process
(9) Review the plans and specifications during the planning and design phases
(10) Attend prebid meeting to detail the commissioning contractor requirements
(11) Review and approve the operation and maintenance manuals to compile the systems manual
(12) Track and document issues and deviations to the owner's project requirements and log resolutions in the issues log
(13) Write and review commissioning process progress reports
(14) Organize and coordinate system testing
(15) Witness system testing
(16) Review installation and record documents
(17) Recommend acceptance of the systems to the owner
(18) Track development, accuracy, and compliance with sequence of operation
(19) Compile and submit the final fire protection and life safety systems commissioning team report to the owner

A.5.2.2.2 Fire protection and life safety systems commissioning team members should be selected as their role in the project is identified. *(See Annex C for suggested responsibilities for team members.)*

A.5.2.2.3 Other team members should not be required to be part of the fire protection and life safety systems commissioning team if they are not included as part of the project. Additional key team members should be identified and selected as the project progresses and as roles and responsibilities require their participation. The exact size and members of the fire protection and life safety systems commissioning team can vary depending on project type, size, and complexity and can include the following additional members:

(1) Commissioning authority.
(2) Installation contractor(s). The installation contractor might not be identified until the construction phase and therefore would not be a participant in the planning or design phases.
(3) Manufacturer's representatives. Manufacturer's representatives might not be identified until the design phase and therefore would not be a participant during the planning phase.
(4) RDP(s).
(5) Construction manager/general contractor.
(6) Owner's technical support personnel.
(7) Facility manager or operations personnel.
(8) Insurance representative.
(9) Third-party test entity.
(10) Authority having jurisdiction. The definition of authority having jurisdiction provides information as to the large range of entities and individuals that can be an authority having jurisdiction. Any and all authorities having jurisdiction should be included as part of the fire protection and life safety systems commissioning team to the extent they are deemed to need to be involved. *(See 3.2.2, Authority Having Jurisdiction.)*
(11) Integrated testing agent. The responsibilities of an integrated testing agent can be fulfilled by the fire commissioning agent, if the fire commissioning agent also meets the integrated testing agent qualifications found in NFPA 4.

A.5.2.3.2 Commissioning plans should be created or modified based on the simplicity or complexity of the project. All information in the commissioning plan should be project specific. Although the following list of items appears in the planning stage, it is acknowledged that some of these headings will not have any content until the design phase or possibly the construction stage. The suggested structure of the commissioning plan is as follows:

(1) Introduction — purpose and general summary of the plan
(2) Commissioning scope — identifies which building assemblies, systems, subsystems, and equipment will be subjected to the commissioning processes
(3) General project information — overview of the project, emphasizing key project information and delivery method characteristics, including the owner's project requirements and project basis of design

(4) Team contacts — project-specific fire protection and life safety systems commissioning team members and contact information
(5) Communication plan and protocols — documentation of the communication channels to be used throughout the project
(6) Commissioning process — detailed description of the project-specific tasks to be accomplished during the planning, design, construction, and tenant occupancy stages with associated roles and responsibilities
(7) Commissioning documentation — list of commissioning documents required to identify expectations, track conditions and decisions, and validate/certify performance
(8) Commissioning schedule — specific sequences of operation of events and relative time frames, dates, and durations

The following materials should be added as annex sections of the completed commissioning plan:

(1) Owner's project requirements
(2) Basis of design
(3) Commissioning specifications
(4) Design review
(5) Submittal review
(6) Issues log
(7) Construction checklists
(8) Site visit and commissioning meeting minutes
(9) Systems manual review
(10) Training
(11) Procedures for testing integrated systems
(12) Warranty review

Warranty review includes a review of all documentation relating to inspection, testing, maintenance, repair, and/or inadvertent system activation that occurred during the warranty period. The purpose of the warranty review is to determine if any modifications or adjustments to the system(s) are required.

A.5.3.1(1) The following specific features of the building or structure should be identified in the basis of design:

(1) Building use group or occupancy classification
(2) Total area of the building
(3) Building height
(4) Number of floors above grade
(5) Number of floors below grade
(6) Area per floor
(7) Type(s) of hazardous areas within buildings
(8) Type(s) of construction
(9) Site access arrangement for emergency response vehicles
(10) Descriptions of fire protection and life safety systems
(11) Year of original construction and known major expansions/remodels

A.5.3.1(2) Each fire protection and life safety system should be listed, including the following information:

(1) System required by code or installed voluntarily
(2) System is a complete or partial installation
(3) System is an addition or modification to an existing system

A.5.3.1(3) Describe performance criteria and the decisions made to achieve the performance objectives, including the following:

(1) Building occupant notification and evacuation procedures
(2) Emergency personnel response
(3) Site and systems features
(4) Safeguards during construction, including fire prevention and emergency procedures
(5) Impairment plans when modifying existing systems

A.5.3.1(4) Identify the codes and standards that apply to the design, plan review, installation, testing, acceptance, inspection, and maintenance of the proposed fire protection and life safety systems. Codes and standards referenced and utilized in the design of each fire protection and life safety system should be referenced with version or revision date, including:

(1) NFPA standards
(2) Applicable local, state, and federal laws and regulations
(3) Specialized codes and standards
(4) Green building design considerations that affect fire and life safety systems

Editions referenced in this document are the latest available during the development of this standard. The user should always consult the authority having jurisdiction to ensure compliance with local requirements.

A.5.3.1(5) The design intent of any alternatives to prescriptive requirements of the codes and standards, including the following, should be identified:

(1) Interpretations and clarifications
(2) Waiver or variance sought through the regulatory appeal process

A.5.3.1(6) Testing criteria should be established and documented. The methods for pre-functional and integrated systems testing should be documented. The fire commissioning agent should identify and document the tools and equipment necessary for testing. The fire commissioning agent should review manuals, standards, manufacturers' documents, and other sources to determine the equipment and tools necessary for each phase of testing. The fire commissioning agent should also confirm which contractors or other appropriate parties should calibrate and schedule the availability of the tools and equipment for the testing dates.

A.5.3.3(3) It is important to document the scope and extent of commissioning activities in the construction documents, typically via the specification. This allows members of the commissioning team not yet part of the project to understand the commissioning scope prior to joining the project.

A.5.3.3(8) The issues and changes should be included in a log that documents the date the issue was raised, the responsibility for resolution of the issue, the resolution of the issue, and the date the issue was resolved.

A.5.4.1.2(4) Examples of passive fire protection having operable parts include opening protectives such as fire doors, fire windows, and fire dampers.

A.5.4.2.1 Operation and maintenance manuals should be organized and written in a complete and concise manner to improve the ability of the building operator or maintenance technician to fully understand the performance characteristics of the system and the maintenance requirements necessary to achieve the intended performance. Typically, operation and maintenance manuals are provided near the end of the construction phase.

A.5.4.3.1 A quality training session for system operation and maintenance should include the following:

(1) Practical examples and hands-on operation of the system
(2) A course agenda
(3) The expected system performance
(4) Problems or modifications encountered during construction
(5) Routine testing and maintenance requirements
(6) Operation and maintenance manuals

Additional training should be conducted after several years. This will allow the facility staff to be trained on system upgrades or modifications. This can be accomplished in conjunction with lesson-learned workshops.

A.5.4.3.2 Secondary systems training should be held after integrated systems testing has been completed to allow follow-up questions and the opportunity to ask questions about situations and problems that occurred during testing.

A.5.4.3.3 Sign-in sheets are useful for the contractor and fire protection and life safety systems commissioning team to demonstrate that training was conducted. Training sessions can be video-recorded to allow for future reference.

A.5.4.4.1 Closeout documents should include, but not be limited to, the following:

(1) Deficiency log showing the resolution of each item
(2) Operations and maintenance manuals
(3) Test reports
(4) Certificate of occupancy
(5) Record drawings
(6) Warranties
(7) Spare parts list and supplier listings
(8) Re-commissioning plan
(9) Sequence of operation
(10) Current digital copy of site-specific software for fire protection and life safety systems

The current digital copy of site-specific software should include building automation or other integrated systems. Some thought should be given to the media used to submit the software. Some media could soon be obsolete and other media can deteriorate, corrupting the data. At issuance of this document, a USB flash drive should be considered an appropriate media.

A.5.4.5 Phased construction, where different parts of a building or system are completed at different times, might involve turning over documents and systems (completed or partial) to the owner at different times.

A.5.5.1.1 For example, it can be appropriate to test stair pressurization in both winter and summer conditions.

A.5.5.2.1 Additional testing should be performed when modifications are made. Additions, modifications, or alterations to systems can cause unintended consequences. The testing procedure should be re-evaluated to make sure that the repeat testing is adequate to determine the correctness of the revision.

A.5.5.2.2 Design documents should be kept for the life of the facility. When there is a change in ownership, the documents should be transferred to the new owner. When changes are made to the use of the facility, the owner's project requirements should be re-evaluated. Significant changes to the owner's project requirements can cause a need to recommission.

A.5.5.3 Continuous training should ensure systems are maintained and tested properly and the building or structure operates successfully.

A.6.2.2 If any of the original information in 5.2.3 is unavailable, such information should be developed by the fire protection and life safety systems commissioning team utilizing as much historical information as possible with the owner's project requirements or basis of design as the basis for any assumptions.

A.6.2.3 Re-commissioning should be considered where expansion, improvement, or addition to an existing structure changes the original owner's project requirements or basis of design. For example, an existing manufacturing facility utilizes a combination of automatic sprinklers and local-application dry-chemical fire suppression systems. The fire protection and life safety systems commissioning process, as outlined in this standard, was followed through the design, construction, and occupancy phases. The owner has elected to replace some of the existing manufacturing lines with a new process. This process has the potential to change the owner's project requirements and basis of design; therefore, the fire protection and life safety systems should follow re-commissioning to update/modify the original owner's project requirements and basis of design and verify that the systems will function as intended.

The scope of the re-commissioning process should be evaluated by the fire protection and life safety systems commissioning team to determine the extent of systems that need to be part of this process. For example, replacement of a single smoke detector in a corridor would not necessitate testing of the entire building's fire protection and life safety systems and re-commissioning would not be needed. However, if that smoke detector is connected to the elevator recall system via direct contact, the elevator recall system would be affected by this change and the fire alarm and elevator recall system should be included in partial re-commissioning. If that connection is via control module, then replacement of the smoke detector would not impact the operation of the elevator recall system and re-commissioning would not be needed.

A.6.2.5.1 The scope and extent of the fire protection and life safety systems commissioning team might be limited based on the number of systems and their age. For example, it could be difficult to locate the original installation contractor or, if located, there might be no one familiar with the original installation. In this instance, the original installation contractor might not provide value to the fire protection and life safety systems commissioning team. The same could be said for the general contractor. Only those members who provide value, either via historical knowledge or technical information, need to be included on the fire protection and life safety systems commissioning team.

A.6.2.5.3 Care should be taken to ensure that revisions to the owner's project requirements or basis of design are made based on operational changes at the facility, not code or standard changes. If the existing fire protection and life safety systems were designed and installed under a previous edition of a code or standard, re-commissioning does not require the systems to be modified to meet the current edition of a code or standard unless required by the owner.

A.6.2.5.7 Functional performance testing can be performed on a sampling basis if noted in the fire protection and life safety systems commissioning plan. The purpose of re-

commissioning is to verify that the existing fire protection and life safety systems function as they did upon initial occupancy. If no changes have occurred to the owner's project requirements, basis of design, or facility, then sampling might be an appropriate method to verify proper functionality. If changes have occurred to the owner's project requirements, basis of design, or facility, complete functional performance testing, as was performed during initial fire protection and life safety systems commissioning, might be appropriate. This determination should be made by the fire protection and life safety systems commissioning team.

A.6.2.5.9 The extent of the knowledge of the on-site personnel performing the inspection, testing, and maintenance of these systems should be determined by the fire protection and life safety systems commissioning team. For many facilities with less complex fire protection and life safety systems, the on-site personnel performing the inspection, testing, and maintenance of these systems might only need a simple understanding of the requirements in *NFPA 72* and NFPA 25, how the fire alarm system operates, and how to reset the system when the system operates. However, in facilities with complex fire protection and life safety systems, the inspection, maintenance, and testing personnel would need a more detailed knowledge of the system and the requirements in the applicable NFPA codes and standards including the sequence of operation.

A.6.3.1 As noted previously, retro-commissioning is performed where the fire protection and life safety systems commissioning process was not followed during the design, construction, and occupancy phases. Information required for retro-commissioning should be developed from a survey and evaluation of installed fire protection and life safety systems, existing operational conditions, and interviews with on-site personnel.

A.6.3.2 Retro-commissioning should be considered when either the design intent or the functionality of the existing fire protection and life safety systems are in question. For example, an existing, 50-year-old aircraft hangar utilizes a foam-water deluge sprinkler system released via spot-type heat detectors. It is unclear if fire protection and life safety systems commissioning, as outlined in this standard, was utilized during the design and installation of the fire protection system. Retro-commissioning of the existing system should be performed to determine the original design intent, to determine whether that design intent meets the current facility usage, and to verify that the existing systems function as intended for the current usage of the facility.

Because documentation on existing systems is typically not available in a retro-commissioning scenario, the fire protection and life safety systems commissioning team must devote a significant amount of time reviewing as much historical information as possible. The owner should not expect a fire commissioning agent to simply walk into a building and begin functional performance testing with no knowledge of the owner's project requirements, basis of design, or sequence of operations. For example, in a 30-story high-rise office building with a voice evacuation system, a fire commissioning agent cannot test audible and visual notification without first determining if the fire alarm system is arranged for general or selective evacuation and then further if the selective evacuation requires occupants to transfer to different floors or to simply evacuate the building.

A.6.3.2.1 The scope and extent of the fire protection and life safety systems commissioning team might be limited based on the number of systems and their age. For example, it could be difficult to locate the original installation contractor or, if located, there might be no one familiar with the original installation. In this instance, the original installation contractor might not provide value to the fire protection and life safety systems commissioning team. The same could be said for the general contractor. Only those members who provide value, either via historical knowledge or technical information, should be included on the fire protection and life safety systems commissioning team.

A.6.3.2.2 Because an owner's project requirements are not typically available for systems in retro-commissioning, the fire protection and life safety systems commissioning team should develop the owner's project requirements through dialogue with the owner or other stakeholders. Historical documentation, to the extent available, should be reviewed in an attempt to determine the original owner's project requirements. This should then be compared to current operational needs.

Care should be taken to ensure that any revisions to the assumed original owner's project requirements are made based on operational changes at the facility, not code or standard changes. If the existing fire protection and life safety systems were designed and installed under a previous edition of a code or standard, retro-commissioning does not require the systems to be modified to meet the current edition of a code or standard unless required by the owner.

A.6.3.2.4 Technically, this document will not be a true basis of design as it was not developed by the RDP responsible for the original system design. That said, a basis of design must be developed to not only fully understand the current system intent but also for future fire protection and life safety systems commissioning activities. The older systems become, the less historical data is available for review. By documenting the assumed basis of design as early in the life of the systems as possible, both the fire protection and life safety systems commissioning team and the owner gain a better understanding of the system intent and whether it meets the current owner's project requirements.

A.6.3.2.10 Functional performance testing can be performed on a sampling basis if noted in the retro-commissioning plan. The purpose of retro-commissioning is to verify that the existing fire protection and life safety systems meet the performance noted in the original (assumed) basis of design as modified by the current owner's project requirements. The determination of the extent of sampling should be made by the fire protection and life safety systems commissioning team.

A.6.3.2.12 The extent of the knowledge of the on-site personnel performing the inspection, testing, and maintenance of these systems should be determined by the fire protection and life safety systems commissioning team. For many facilities with less complex fire protection and life safety systems, the on-site personnel performing the inspection, testing, and maintenance of these systems might only need a simple understanding of the requirements in *NFPA 72* and NFPA 25, how the fire alarm system operates, and how to reset the system when the system operates. However, in facilities with complex fire protection and life safety systems, the on-site inspection, maintenance, and testing personnel would need a more detailed knowledge of the system and applicable requirements in the applicable NFPA codes and standards including the sequence of operation.

Annex B Qualifications of Fire Protection and Life Safety Systems Commissioning Team Personnel

This annex is not a part of the requirements of this NFPA document but is included for informational purposes only.

B.1 Applicability. Members of the fire protection and life safety systems commissioning team should meet the qualifications of this annex.

B.2 Qualifications.

B.2.1 Fire Commissioning Agent.

B.2.1.1 General. The fire commissioning agent should have no financial interest (e.g., owner, division or subsidiary, partner, operating officer, distributor, salesman, or technical representative) in any fire protection or life safety equipment manufacturers, suppliers, or installers for any such equipment provided as part of a project. As such, qualified, independent third-party firms or individuals should be considered for designation as the fire commissioning agent. The fire commissioning agent should have a minimum of 5 years' experience in facility construction, inspection, acceptance testing, or commissioning as it relates to fire protection and life safety.

B.2.1.2 Requisite Knowledge. A qualified fire commissioning agent should have an advanced understanding of the installation, operation, and maintenance of all fire protection and life safety systems proposed to be installed, with particular emphasis on integrated systems testing.

Δ **B.2.1.3 Requisite Skills.** A fire commissioning agent should have the ability to do the following:

(1) Read and interpret drawings and specifications for the purpose of understanding system installation, testing, operation, and maintenance
(2) Analyze and facilitate resolution of issues related to failures in fire protection and life safety systems
(3) Provide clear, concise written reports and verbal communication, and resolve conflicts

B.2.2 Installation Contractor. Where required by the local jurisdiction, installation contractors should be licensed or certified to perform the work.

B.2.2.1 Installation contractors should be knowledgeable and experienced in the installation of the type of system proposed to be installed.

B.2.2.2 The installation contractor should submit evidence of any required license or certification to the fire commissioning agent where required by the jurisdiction. Installation contractors should be certified by an organization responsible for certification of technical installation personnel and approved by the authority having jurisdiction.

B.2.3 Registered Design Professional.

B.2.3.1 The RDP should be individually identified in the specifications or other enabling documentation.

B.2.3.2 Requisite Knowledge. A qualified RDP should have comprehensive knowledge of the following:

(1) The design, installation, operation, and maintenance of the systems proposed to be included in the design
(2) How individual and integrated systems operate during a fire or other emergency

Δ **B.2.4 Construction Manager and General Contractor.** Construction managers and general contractors should be knowledgeable and experienced in construction project management. Construction managers and general contractors should possess skills in the following categories of construction management:

(1) Project management planning
(2) Cost management
(3) Time management
(4) Quality management
(5) Contract administration
(6) Safety management
(7) Professional practice

Additional skills should include specific activities such as defining the responsibilities and management structure of the project management team, organizing and leading by implementing project controls, defining roles and responsibilities and developing communication protocols, and identifying elements of project design and construction likely to give rise to disputes and claims.

B.2.5 Facilities Management Personnel. Facilities management personnel should include building maintenance and service personnel, building engineering personnel, and similar job functions.

B.2.5.1 Facilities management personnel should have the ability to perform the following:

(1) Assess a facility's need for building systems and recommend building systems
(2) Oversee the operation of building systems
(3) Establish practices and procedures
(4) Administer the allocation of building systems resources
(5) Monitor and evaluate how well building systems perform
(6) Manage corrective, preventative, and predictive maintenance of building systems
(7) Develop and implement emergency procedures and disaster recovery plans

B.2.5.2 Facilities management personnel should be knowledgeable and qualified in the operation and maintenance of the fire protection and life safety systems installed in their facility. The level of knowledge required should be commensurate with the level of interaction with the systems.

B.2.5.3 Facilities management personnel who perform the ongoing system operation, inspection, testing, and maintenance should be thoroughly familiar with the required and recommended operation and maintenance tasks.

B.2.5.4 Facilities management personnel responsible for management of a contract for system operation, inspection, testing, and maintenance should be thoroughly familiar with the tasks to be performed and the frequency of such tasks, but not necessarily the implementation of those tasks.

B.2.6 Third-Party Test Entity.

B.2.6.1 Third-party test entities should have an advanced understanding of the installation, operation, and maintenance of all fire protection and life safety systems proposed to be tested, with particular emphasis on integrated systems testing.

B.2.6.2 Third-party test entities should be licensed or certified where required by the authority having jurisdiction or codes and standards.

B.2.6.3 The third-party test entities should have the ability to do the following:

(1) Read and interpret drawings and specifications for the purpose of understanding system installation, testing, operation, and maintenance
(2) Provide good written and verbal communication skills, and conflict resolution and organizational skills

B.2.7 Authority Having Jurisdiction. Governmental authorities having jurisdiction (e.g., fire inspection personnel) should have the ability to determine the operational readiness of fire detection and alarm systems and fire suppression systems, given test documentation and field observations, so that systems are in an operational state. Fire inspection personnel should be able to verify code compliance of heating, ventilating, and air conditioning equipment and operations so that the systems and other equipment are maintained in accordance with applicable codes and standards. In addition, fire inspection personnel involved in fire protection system commissioning should be able to witness an acceptance test for integrated fire protection systems so that the test is conducted in accordance with the approved design and applicable codes and standards, and the system performance can be evaluated for compliance. Individuals should be able to demonstrate knowledge of the codes and standards related to the installation and operational requirements of integrated fire and life safety systems, such as elevator recall or operation of a smoke removal system upon activation of fire detection devices, or other integrated operations of fire protection systems in a structure in accordance with the applicable building, mechanical, or fire codes of the jurisdiction.

B.2.7.1 The authority having jurisdiction should be knowledgeable in the applicable codes, ordinances, and standards as they relate to the fire protection and life safety systems installed.

B.2.7.2 The authority having jurisdiction should have the ability to interface with the RDP and the commissioning authority in all phases of the commissioning process.

B.2.7.3 The authority having jurisdiction should have the ability to determine the operational readiness of the fire protection and life safety systems installed.

B.2.7.4 The authority having jurisdiction should have the ability to interface with the fire protection and life safety systems commissioning team to verify completion of integrated systems testing for the purpose of system acceptance.

B.2.8 Integrated Testing Agent.

B.2.8.1 The integrated testing agent should meet the qualifications found in NFPA 4.

B.2.9 Insurance Representative. The insurance representative should be knowledgeable and experienced in property loss prevention and life safety to mitigate possible risk.

Annex C Responsibilities for Members of the Fire Protection and Life Safety Systems Commissioning Team

This annex is not a part of the requirements of this NFPA document but is included for informational purposes only.

C.1 Installation Contractor. The installation contractor's responsibilities should include the following:

(1) Provide commissioning process requirements and activities as specified in the construction documents
(2) Attend required fire protection and life safety systems commissioning team meetings
(3) Include or comply with commissioning process milestones in the project schedule
(4) Implement the training program as required by the construction documents
(5) Provide submittals to the RDP, owner, and fire protection and life safety systems commissioning team
(6) Develop an individual system test plan, including acceptance and integrated systems testing
(7) Notify the general contractor, third-party test entity, and fire commissioning agent when systems are ready for testing
(8) Demonstrate the performance of the systems, including integration
(9) Complete the construction checklists as the work is accomplished
(10) Maintain the record drawings as required by the construction documents

C.2 Manufacturer's Representative. The manufacturer's representative's responsibilities should include the following:

(1) Provide technical support to the installation contractor
(2) Provide all information required for the operation and maintenance of the system
(3) Provide the requirements to maintain the warranty as part of the initial submittal
(4) Assist the installation contractor in the development of the individual systems test plans
(5) Assist the installation contractor and fire protection and life safety systems commissioning team with installation verification and testing
(6) Assist in development and implementation of system training

C.3 Registered Design Professional. The RDP's responsibilities should include the following:

(1) Participate and assist in the development of the owner's project requirements
(2) Create and document the basis of design
(3) Prepare construction documents
(4) Respond to the fire protection and life safety systems commissioning team's design submission review comments
(5) Specify operation and maintenance of systems in the project specification
(6) Review and incorporate the fire protection and life safety systems commissioning team's comments, as appropriate

(7) Review test procedures submitted by the installation contractor
(8) Review and comment on the commissioning record
(9) Review and accept record documents as required by the construction documents
(10) Review and comment on the final commissioning record
(11) Recommend final acceptance of the systems to the owner

C.4 Construction Manager/General Contractor. The construction manager's/general contractor's responsibilities should include the following:

(1) Include commissioning process requirements and activities in all contracts
(2) Obtain cooperation and participation of all subcontractors and manufacturers' representatives
(3) Attend required fire protection and life safety systems commissioning team meetings
(4) Include commissioning process milestones in the project schedule
(5) Notify the fire commissioning agent when systems are ready for testing
(6) Certify that all work has been completed and the facility is operational in accordance with the construction documents
(7) Remedy deficiencies identified by the fire protection and life safety systems commissioning team during installation verification or testing
(8) Review and comment on the final commissioning record

C.5 Insurance Representative. Discussions should be performed between insurance representatives and the fire protection and life safety systems commissioning team during the planning phase to determine the overall scope of services to be provided by the insurance representative.

The insurance representative's responsibilities should include the following services, as contracted with the owner:

(1) Provide fire protection recommendations to RDP for inclusion in the basis of design and other construction documents
(2) Review the construction documents during the planning and design phases to evaluate alignment with insurance risk management recommendations
(3) Participate in commissioning team meetings, as necessary, to ensure scope of project, responsibilities, and project time line (including commissioning) is established and agreed upon
(4) Visit project site during installation phase to confirm that physical/actual installation is consistent with reviewed/accepted construction documents, as necessary
(5) Review and approve proposed inspection, testing, performance criteria, and documentation recommended for acceptance of commissioning
(6) Witness installation verification and system testing in conjunction with the commissioning team, as necessary
(7) Verify any issues detected during commissioning are resolved in a timely and an appropriate manner
(8) Verify adequate training and documentation is provided for onsite personnel, including adequate signage on equipment for operation of a fire protection system and complete record drawings
(9) Review final commissioning documentation

C.6 Owner's Technical Support Personnel. The owner's technical support personnel's responsibilities should include the following:

(1) Review and comment on the owner's project requirements
(2) Provide technical assistance to the fire protection and life safety systems commissioning team, RDP, and installation contractor
(3) Review any changes to the owner's project requirements
(4) Review the construction documents
(5) Review the fire protection and life safety systems commissioning team's commissioning process progress reports
(6) Review the fire protection and life safety systems commissioning team's progress reports
(7) Review the fire protection and life safety systems commissioning team's commissioning record
(8) Review the systems manual

C.7 Third-Party Test Entity. The third-party test entity's responsibilities should include the following:

(1) Include all commissioning process requirements and activities in the scope of services
(2) Attend required fire protection and life safety systems commissioning team meetings
(3) Include commissioning process milestones in the project schedule
(4) Develop individual system test plan, including acceptance and integrated systems testing
(5) Demonstrate the performance of the systems, including integration
(6) Complete the construction checklists as the work is accomplished
(7) Develop and submit final testing documentation

C.8 Facility Manager or Operations Personnel. The facility manager or operations personnel's responsibilities should include the following:

(1) Attend systems training sessions
(2) Review and comment on the owner's project requirements
(3) Review and comment on the systems manuals
(4) Organize, coordinate, and implement system inspection, testing, and maintenance as required by the systems manuals

C.9 Authority Having Jurisdiction. The authority having jurisdiction's responsibilities should include the following:

(1) Participate in fire protection and life safety systems commissioning team meetings as necessary
(2) Provide all inspection, testing, and performance criteria required for acceptance and issuance of certificate of occupancy to be included in the commissioning plan
(3) Witness installation verification and system testing in conjunction with the fire protection and life safety systems commissioning team, as necessary
(4) Identify authority having jurisdiction personnel to attend training

Annex D Sample Basis of Design Narrative Report

This annex is not a part of the requirements of this NFPA document but is included for informational purposes only.

D.1 Basis of Design Narrative Report. The narrative should be written in a three-section format including subsections as necessary (methodology, sequence of operation, and testing criteria sections) for clarity and should be limited to a summary. This annex presents a sample format for a narrative report.

D.2 Methodology Section.

D.2.1 Subsection 1: Description. This section should identify specific features of a building that contribute to the overall understanding of the fire protection and life safety systems and features to be provided as part of the design and construction, as follows:

(1) Building and/or structure use group classification in accordance with applicable building code of the jurisdiction
(2) Total aggregate square footage of building
(3) Building height
(4) Number of floors above grade
(5) Number of floors below grade
(6) Square footage per floor
(7) Type(s) of occupancies, hazard classifications, processes
(8) Type(s) of construction
(9) Hazardous material usage and storage
(10) Method of storage arrangements of commodities
(11) Site access arrangement for emergency response vehicles

D.2.2 Subsection 2: Applicable Laws, Regulations, Codes, Ordinances, and Standards. This section identifies regulatory requirements of the jurisdiction that have or can have an impact in the design and approval of fire protection and life safety systems. This section requires the preparer of the narrative to conduct a comprehensive regulatory research such as the following:

(1) Building code fire protection and life safety system requirements
(2) NFPA standards or other applicable recognized standards and edition used for design and or installation of each specific fire protection system
(3) Applicability of any special laws of the jurisdiction that can supersede a code or standard
(4) Applicability of local by-laws or ordinances of the jurisdiction
(5) Applicability of other codes such as plumbing, elevator, and electrical codes that can have an impact on the design, installation, and testing of the fire protection and life safety systems
(6) Applicability of any federal laws such as Occupational Safety and Health Administration, Americans with Disabilities Act, or other governmental entity

D.2.3 Subsection 3: Design Responsibility for Fire Protection and Life Safety Systems. This section identifies the accountability (required by the jurisdiction) for a specific fire protection and life safety system design and the accountability for the integration of the fire protection systems constituting a building or structures fire protection and life safety system(s). There could be options permitted by the jurisdiction.

D.2.3.1 The RDP fully designs (complete layout and calculation) and specifies the fire protection and life safety system or systems to be installed, reviews and approves the installing contractor's shop drawings, and certifies system installation(s) for code compliance at completion. There could be multiple RDP associated with a project and should be identified as appropriate.

D.2.3.2 The RDP provides a partial design and specifies the design criteria to be used by the installing contractor(s), who finalizes the system layout and provides calculations to confirm the design criteria. The RDP certifies system installation for code compliance at completion.

D.2.3.3 At design-build, the installing contractor for a specific fire protection and life safety system completely designs and specifies if permitted by the governmental jurisdiction (develops a full system layout, design criteria, and calculations), installs the system, and certifies system installation for regulatory and applicable standard compliance at completion. There can be a RDP involved but not necessarily.

D.2.3.4 Whichever method from D.2.3.1 through D.2.3.3 is selected, the project requires a qualified person to assume responsibility for the coordination of fire protection and life safety systems requiring integration, forming an entire building fire protection and life safety system.

D.2.4 Subsection 4: Fire Protection and Life Safety Systems to Be Installed.

D.2.4.1 This section should identify key performance design criteria and features for each specific fire protection and life safety system such as the following:

(1) Water supply system such as municipal or private systems, fire mains and hydrants, storage tanks, and fire pumps
(2) Sprinkler systems
(3) Standpipe systems
(4) Fire alarm and signaling systems
(5) Fire extinguishing systems, such as dry chemical, clean agent, water mist systems
(6) Smoke control/management systems, such as automatic smoke exhaust, stair pressurization
(7) Commercial cooking equipment and exhaust systems fire suppression system(s), such as wet chemical or automatic sprinklers
(8) Emergency power systems, such as applicability to fire protection and life safety systems
(9) Hazardous material and process protection, special protection
(10) System supervision, such as method of 24-hour monitoring conditions of fire protection and life safety systems
(11) Passive systems including doors, walls, floors, ceilings, and roof decks

D.2.4.2 The description (specific features) for the fire protection systems listed above should also indicate if the system(s) are as follows:

(1) Required by laws, codes, standards, ordinance, and so forth
(2) Nonrequired, building owner provides voluntarily and/or requirement of insurance entity
(3) A complete new system
(4) An addition or expansion to existing system
(5) A modification/repair to existing system

(6) Level of protection to be provided, 100 percent or partial protection or exempt by regulatory code

D.2.5 Subsection 5: Consideration Used in the Design Methodology. This section identifies the designer's intent in the overall design and criteria development of the fire protection and life safety systems, as follows:

(1) Building occupant notification and evacuation procedures
(2) Emergency response personnel, site, and systems features
(3) Safeguards, fire prevention, and emergency procedures during new construction and impairment plans associated with new and/or existing system modifications
(4) Method for future testing and maintenance of systems and documentation
(5) Special requirements or request of the authority having jurisdiction

D.2.6 Subsection 6: Alternatives. This section identifies the designer's intent to deviate from prescriptive requirements of regulatory codes and standards with alternative methods, as follows:

(1) Application of performance-based design in lieu of prescriptive code requirement
(2) Interpretation/clarification between designer and authority having jurisdiction
(3) Waiver or variance sought and or required by the authority having jurisdiction through the regulatory appeal process

D.3 Sequence of Operation Section. This portion of the narrative is generally a difficult section to write as it entails the specific operation of the fire protection and life safety systems, system devices, and equipment and their related integration, depending on the complexity of the systems installed. The preparer of the narrative should have an overall understanding and knowledge of how all the fire protection and life safety systems should function when integrated together.

D.3.1 Subsection 1. The operational description should include the following:

(1) An operational description of either a system or specific devices within a system and the resulting action associated with the operation of the system or specific devices should be provided.
(2) The operational description should include all interconnected (integrated) fire protection and life safety systems and devices required or nonrequired forming an entire building fire protection and life safety system.
(3) All signage indicating equipment location, operational and design features, and certified documents attesting to system installation integrity should be provided.
(4) The narrative sequence of operation description should be specifically coordinated with the input and output sequence of operation developed for the systems operation.

This section of the narrative report can be brief as in a simple system such as a one-story, 15,000 ft^2 (1400 m^2) mercantile building with only a sprinkler system and manual fire alarm pull boxes, notification devices, and system supervision, or complex, such as in a 25-story high-rise with fire pumps, emergency generator, fire alarm and sprinkler zones, automatic standpipes, automatic voice and manual evacuation signals, smoke management system, automatic elevator recall, special extinguishing systems, remote annunciation, automatic locking devices, alarm retransmission methods, and emergency response procedures.

The sequence of operation of a building fire protection and life safety system, particularly with complicated systems, must be reviewed and understood by the building owner, the authority having jurisdiction, and the entities responsible for installation (generally the fire alarm and building automated systems programming technicians) and future testing and maintenance after the building has been issued a certificate of occupancy. A team approach should be used by developers, designers, equipment suppliers, and contractors including the authority having jurisdiction (more specifically emergency response personnel, such as the local fire department) to clearly describe and understand the proper operation and use of the integrated fire protection and life safety systems.

When a complex system is proposed, the initial narrative report of the sequence of operation should be viewed as a draft. At various stages of system installation(s), modifications could be made due to design changes, equipment changes, new technology availability, and/or changes to codes and standards that would require system modifications. The preparer of the narrative should be familiar with any and all changes to the systems and submit a final accurate narrative for approval and/or acceptance by the authority having jurisdiction, building owner, and other entities prior to witnessing system(s) operational acceptance and commissioning testing.

Communication between the building owner, designers, builders, and the authority having jurisdiction is an important element particularly in this phase, as the codes and the standards tend to be flexible and interpretative relative to sequences of operation of the integrated fire protection and life safety systems.

D.4 Testing Criteria Section. This section of the narrative report should be broken down into three sections, D.4.1, D.4.2, and D.4.3.

D.4.1 Subsection 1: Testing Criteria. This section identifies the individual in charge who will coordinate the final acceptance testing and witnessing by the authority having jurisdiction, as follows:

(1) Identification of qualified person(s) in charge (should be the fire commissioning agent and/or multiple agents if applicable) for setting up and coordinating all prefunctional testing and final testing.
(2) Method of verification and confirmation by the qualified person(s) in charge that all fire protection systems, equipment, and devices have been individually tested and tested as an entire system when specific systems are integrated to form a building fire protection and life safety system.
(3) Method of coordination by qualified person in charge of all designers, contractors, equipment distributors, owners' representatives, and the authority having jurisdiction required to perform and/or witness all testing, testing dates and times, notification to public utilities, and personnel required to perform all required testing as a system or individual system component testing.

D.4.2 Subsection 2: Equipment and Tools. This section will identify the necessary equipment available on site at time of witnessing the operational features and/or integrated performance of the fire protection and life safety systems that require validation by the owner and/or the authority having jurisdiction to expedite the acceptance and commissioning testing, as follows:

(1) Identification of equipment, documents, and procedures to be used to verify system performance and confirm design methodology and specifications, code and standards compliance, and accuracy of fire protection and life safety system(s) sequence of operation.
(2) Examples include the following:
    (a) Manufacturer's instructions
    (b) Specification instructions
    (c) Requirements of the authority having jurisdiction
    (d) Narrative, sequence of operation section
    (e) Smoke machines, smoke candles
    (f) Sound meters
    (g) Fire hoses, nozzles
    (h) Flow measuring devices
    (i) Gauges
    (j) Air balancing and air measuring meters
    (k) Door force closing and opening measuring devices
    (l) Voltage meters
    (m) Magnets
    (n) Communication radios
    (o) Fire department equipment
    (p) Special tools, keys
    (q) Ladders
    (r) Safety equipment
    (s) Notifications announcements
    (t) Signs
    (u) Charts, forms, checklist, logs
    (v) Acceptance test forms

D.4.3 Subsection 3: Approval Requirements. This section identifies all the closeout documents required by the owner and the authority having jurisdiction as part of the overall commissioning process, as follows:

(1) Identify method of approval (acceptance) required (verbal or written) from the owner and the authority having jurisdiction if system satisfied all applicable codes and standards compliance requirements
(2) Identify method of remedial action when a system or portion of a system fails to operate as specified and or as required by codes and standards or the sequence of operations
(3) Documentation to be submitted at completion verifying that systems are in compliance with all applicable codes and standards, requirements of the authority having jurisdiction, narrative, design and specifications, and sequence of operations
(4) Documentation to be submitted to the authority having jurisdiction listing names, addresses, and phone numbers of personnel for emergency notification

Annex E Sample Commissioning Documentation

This annex is not a part of the requirements of this NFPA document but is included for informational purposes only.

E.1 Sample Commissioning Documentation. The forms listed in this annex are recommended as useful tools to document critical path activities related to systems commissioning and project management. It is not the intent of this standard to mandate the use of these forms. The user is encouraged to modify the forms or use other documentation to capture and document pertinent commissioning-related activities.

E.1.1 Basis of Design. Figure E.1.1 can be used to capture the owner's project requirements as recommended by 5.2.3.

E.1.2 Equipment Scope and Responsible Parties. Figure E.1.2 is intended to identify the area and application of each fire and life safety system. The form can be used in conjunction with the basis of design.

E.1.3 Project Schedule. The project schedule can be any adaptation of a spreadsheet. The example shown in Figure E.1.3 should be modified to suit the specific parameters of each project.

E.1.4 Project Management Forms. Figure E.1.4(a) through Figure E.1.4(i) are examples of project management documentation that should be used on most projects where commissioning is required. Any adaptation of these forms should be permitted to document appropriate commissioning activities.

BASIS OF DESIGN

Project name _____

Contract number _____

BUILDING

Intended use _____

Construction type(s) _____

Building height _____ Total area [ft² (m²)] _____

Number of floors above grade _____ Number of floors below grade _____

Area per floor [ft² (m²)] _____

DESCRIPTION OF OCCUPANCIES OR HAZARDS WITHIN BUILDING

_____

_____

_____

_____

DESIGN CODES *(Indicate editions.)*

_____

_____

_____

SITE ACCESS FOR EMERGENCIES *(Include changes during construction stages.)*

_____

_____

_____

RESOURCES FOR FIRE FIGHTING *(List when available during construction stages.)*

_____

_____

_____

SPECIAL CONSIDERATIONS

_____

_____

_____

_____

_____

_____

_____

Δ FIGURE E.1.1 Sample Basis of Design.

EQUIPMENT SCOPE AND RESPONSIBLE PARTIES

Equipment	Required (Y/N)	Area Protected	New, Addition, or Modification	Design	Plan Review	Installation	Acceptance
				(List responsible party and specific codes, standards, laws, and regulations applicable for each stage from design to acceptance.)			
Fire alarm							
Water-based sprinkler systems							
Standpipe and hose systems							
Water spray fixed systems							
Foam-water systems							
Water mist systems							
Wet chemical systems							
Dry chemical systems							
Inert gas systems							
Low expansion foam systems							
Private fire service mains							
Private hydrants							
Water tanks							
Stationary pumps for fire protection							
Smoke-control systems							
Emergency power systems							
Other							
Other							

Δ FIGURE E.1.2 Equipment Scope and Responsible Parties.

PROJECT SCHEDULE

Project name ______________________ Contract number ______________________ Date __________

Building System						

D = Design A = Approval F = Fabrication I = Installation

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Δ **FIGURE E.1.3 Sample Project Schedule.**

COMMISSIONING SUBMITTAL / APPROVAL

Project: _____ Submittal No.: _____

❑ New ❑ Resubmittal

From (initially): _____ To: _____

Equipment / system name: ID #:

_____ _____ Cx Section No: _____

_____ _____

_____ _____

Submittal Type:

❑ Documentation (describe): _____

_____

❑ Functional test procedure forms: _____

❑ Completed functional test procedure record or report: _____

❑ Prefunctional checklist: _____

❑ Startup and initial checkout forms: _____

❑ Completed startup documentation or report: _____

Submissions / Returns

Path	To: _____ From (initially): _____	To: _____ From: _____	To: _____ From: _____	To: _____ From: _____	To: _____ From: _____
Comments by submitter	❑ Notes attached	❑ Notes attached	❑ Notes attached	❑ Notes attached	❑ Notes attached
Copies					
Submitter signature					
Title					
Date					
Code					

Submitting Codes:
I = Initial submittal: The attached submittal has been reviewed, and the equipment, documents, or performance represented comply with the correct documents.
A = Approved as complying with the contract documents.
C = Note corrections. Approved, but need to resubmit for the record, after correcting.
NA = Not acceptable. Resubmittal required for review.

Δ FIGURE E.1.4(a) Commissioning Submittal/Approval.

SEQUENCES OF OPERATION AND FUNCTIONAL TEST PROCEDURES SUBMITTAL

Project: _____ Submittal No: _____

❑ New ❑ Resubmittal

From (initially): _____ To (initially): _____

Equipment / System tag and name: _____

Included:

❑ Sequences of operation (enlarged from original control drawings and specification documents)

❑ Functional test procedures and forms

Submissions / Returns

The following checked individuals will receive these documents for review and/or approval:

Party	For review and comment only	For review and approval	For record only
General contractor	❑	❑	❑
Mechanical contractor	❑	❑	❑
Electrical contractor	❑	❑	❑
Controls contractor	❑	❑	❑
Construction manager	❑	❑	❑
Owner's representative	❑	❑	❑
AHJ	❑	❑	❑

Path	To: _____ From: _____	To: _____ From: _____	To: _____ From: _____	To: _____ From: _____	To: _____ From: _____
Comments by submitter	See Key (1) ❑ Notes attached	See Key (1) ❑ Notes attached	See Key (1) ❑ Notes attached	See Key (1) ❑ Notes attached	See Key (1) ❑ Notes attached
Copies					
Submitter signature					
Title					
Date					
Review code					

Key: (1) Review and comment on the sequences and/or test procedures as to their compliance with the specs.
(2) Check tests for personnel safety and to keep equipment warranty in force.

Review Codes: AM = Approved by mechanical contractor (or electrical contractor) as complying with the contract documents. Tests will not void warranty or damage equipment and do not present unsafe conditions for personnel.
AC = Approved by controls contractor as complying with the contract documents.
AE = Approved by the design engineer as complying with the contract documents.
NC = Note corrections. Approved, but need to resubmit for the record, after correcting.
NA = Not acceptable. Resubmittal required for review.

Abbreviations: CA = commissioning agent/authority, CM = construction manager, GC = general contractor's rep., A/E = architect or engineer of record, Sub = responsible subcontractor or vendor

Δ **FIGURE E.1.4(b) Sequence of Operation and Functional Test Procedures Submittal.**

COMMISSIONING TEST OR DOCUMENT APPROVAL

Project: _____ To: _____

From: _____

❑ Completed functional test approval

Equipment/System name: _____ Equipment tag: _____

Functional test description: _____

_____

❑ Document review

Document name and ID: _____

Review description: _____

_____

The test(s) of the above equipment or the review of the referenced document(s) have been completed and performance of the component, system, or documents complies with the acceptance criteria in the testing or document requirements of the Specifications and Contract Documents, subject to the changes being made as listed below or on an attached sheet.

_____ Sheets attached

A copy of the completed test or document review is attached. ❑ Yes ❑ No

Commissioning Agent Approval:

_____ _____

Commissioning Agent Date

Construction Manager Approval:

The test or review results relating to the above equipment has been reviewed and approved as complying with the contract documents.

_____ _____

Construction Manager Date

Exclusions:

_____

_____

_____

_____

_____

cc:

Δ FIGURE E.1.4(c) Cx Test or Document Approval.

COMMISSIONING PROGRESS REPORT

Project: _____ Date: _____

Prepared by: _____ Reporting period: _____ Report #: _____

Commissioning tasks worked on since last report and general progress: _____

Areas where schedule is not being met: _____

Recommended actions: _____

Requested schedule adjustments: _____

Next steps: _____

Other comments (include general comments and field notes): _____

Issues log attached. ❑ Yes ❑ No

_____
Commissioning Agent

Δ FIGURE E.1.4(d) Cx Progress Report.