



Committee Input No. 1-NFPA 3-2012 [Global Input]

Revise NFPA 3 to become a Standard.

Supplemental Information

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Committee Statement and Meeting Notes

Committee Statement: The technical committee is soliciting public comments on how the document can/should be used. There is concern among the technical committee that NFPA 3 will not be utilized if it remains a recommended practice. There are also concerns that if the document is developed as a standard, it will be misapplied. Converting this document to a standard includes revising some of the "should" statements to "shall" statements and moving language that is unenforceable (that cannot be standardized) to the annex. Additional language is provided addressing when NFPA 3 should be used, specifically where it is required by the owner's project requirements.

Response Message: CI-1-NFPA 3-2012

NFPA 3, Standard for Commissioning of Fire Protection and Life Safety Systems, 2015 Edition

Chapter 1 Administration

1.1 Scope. This standard provides the required procedures, methods, and documentation for 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 that will verify fire protection and life safety systems perform in conformity with the Owner's Project Requirements.

A.1.2 System commissioning is critical to ascertain that systems are installed and function in accordance with the BOD and OPR and that testing is documented. It is not the intent of this standard to supplant the existing requirements of other codes and standards, but this standard can provide the appropriate guidance for a specific system or component where testing is not otherwise addressed. Such guidance should be developed by the fire protection and life safety commissioning team.

Fire and life safety systems can have problems during startup and installation. When implemented correctly, a realistic commissioning plan minimizes startup and long-term problems, reduces operational costs, and minimizes future maintenance requirements.

1.3* Application.

A.1.3 Planning for fire protection and life safety in and around a building or structure involves an integrated system approach that enables the system designer to analyze all of the components as a total fire safety system package. This standard is not intended to be applied unless required by applicable codes or standards, the OPR, or an AHJ.

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

1.3.2* When the project specifications require total building commissioning, this standard shall apply as a part of that process.

A.1.3.2 In order to invoke the commissioning requirements in NFPA 3, specifications should read, "The building fire protection systems shall be designed, installed, tested, commissioned, and maintained in accordance with commissioning process of NFPA 3, *Standard for Commissioning and Integrated Testing of Fire Protection and Life Safety Systems*."

1.3.3* This standard applies to passive and active fire protection and life safety equipment and systems including, but not limited to, the following:

(1)* Infrastructure supporting the fire protection and life safety systems within the boundaries of the project

A.1.3.3(1) 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. These infrastructure items can include the following:

- (1) Access roadways for general ingress and egress and those necessary for fire department access in accordance with local codes, standards, and policies
- (2) 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
- (3) 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

(2) Fixed fire suppression and control systems

(3) Fire alarm systems

(4) Emergency communications systems (ECS)

(5) Smoke control and management systems

(6)* Normal, emergency, and standby power systems

A.1.3.3(6) Emergency and standby power supply systems to be commissioned include, but are not limited, to those powering the following:

- (1) Smoke control systems
- (2) Stair pressurization systems
- (3) Smoke-proof enclosure ventilation systems
- (4) Electric driven fire pumps
- (5) Fire service access elevators
- (6) Fire suppression system controllers
- (7) Explosion prevention and control systems
- (8)* Fire-resistant and smoke-resistant assemblies

A.1.3.3(8) Examples include, but are not limited to, floor ceilings and roof decks, doors, windows, barriers, and walls protected by a firestop system or device for through-penetrations and membrane penetrations, and other fire and smoke control assemblies.

(9)* Firestopping

A.1.3.3(9) Examples include, but are not limited to, fire and smoke resistant-rated assemblies protected by a firestop system or device for through-penetrations and membrane penetrations.

(10) Systems associated with commercial cooking operations

(11) Elevator systems

(12)* Means of egress systems and components

A.1.3.3(12) Egress system and egress components should include the following:

(1) Emergency lighting and exit signs

(2) Major egress components, such as corridors, stairs, ramps, and so forth

(3) Exit path marking systems

(13) Other systems or installations integrated or connected to a fire or life safety system, such as, but not limited to, access control, critical processes, and hazardous operations

Chapter 3 Definitions

3.1 General. The definitions contained in this chapter 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, is the source for the ordinarily accepted meaning.

3.2 NFPA Official Definitions.

3.2.1* Approved. Acceptable to the authority having jurisdiction.

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.

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.

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.

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.

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.

3.2.4 Shall. Indicates a mandatory requirement.

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

3.2.6 Standard. A document, the main text of which contains only mandatory provisions using the word "shall" to indicate requirements and which is in a form generally suitable for mandatory reference by another standard or code or for adoption into law. Nonmandatory provisions shall be located in an appendix or annex, footnote, or fine-print note and are not to be considered a part of the requirements of a standard.

3.3 General Definitions.

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

A.3.3.1 Basis of Design (BOD). The BOD is normally used to assist the commissioning authority and the AHJ in the plan review, inspection, and acceptance process.

3.3.2* Building. Any structure used or intended for supporting or sheltering any use or occupancy. [101, 2012]

A.3.3.2 Building. The term *building* is to be understood as if followed by the words "or portions thereof." The intent is to also apply this standard to structures such as roadway and transit tunnels, bridges, towers, fuel storage facilities, and other structures insofar as this document applies.

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 applicable 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.

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

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

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.

3.3.3.4 Commissioning Record. The complete set of commissioning documentation for the project that is turned over to the owner at the end of the construction phase.

3.3.3.5* Fire and Life Safety Commissioning (FCx). A systematic process that provides documented confirmation that fire and life safety systems function according to the intended design criteria set forth in the project documents and satisfy the owner's operational needs, including compliance with requirements of any applicable laws, regulations, codes, and standards requiring fire and life safety systems.

A.3.3.3.5 Fire and Life Safety Commissioning (FCx). 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, O&M documentation verification, and the training of operating personnel.

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

3.3.3.7* Re-commissioning (Re-Cx). For existing fire protection and life safety systems that were previously subject to FCx, the process of verifying system performance continues to meet the OPR and BOD.

A.3.3.3.7 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 OPR and BOD, unless changes to the building have occurred which would require changes to the OPR and BOD.

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

A.3.3.3.8 Retro-commissioning (RCx). 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. This is achieved by researching and documenting the original OPR and BOD to the best extent practical as well as the current operational needs. Once the OPR and BOD 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.

3.3.4 Component. A part of an architectural, electrical, or mechanical system. [5000, 2012]

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, 2009]

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

3.3.7 Inspection. A visual examination of a system or portion thereof to verify that it appears to be in operating condition and is free of physical damage. [820, 2012]

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

A.3.3.8 Installation Contractor. Installation contractors often provide shop drawings, working plans, and other related documents.

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

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

3.3.11* 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.

A.3.3.11 Narrative. The narrative is written to assist and expedite the plan review and inspection process by the AHJ. 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 that it is one of the key documents associated with the commissioning process.

Building owners benefit by knowing how their building's 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 prior to 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 has "taken charge" in 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 non-required fire protection systems set forth by applicable laws, codes, regulations, and local ordinances of the jurisdiction and applicable national and/or international standards.

The narrative should be submitted with plans and specifications for review and approval by the AHJ prior to 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 AHJ 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 has "taken charge" in 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 AHJ; uniformity is not always necessarily achieved. The narrative should attempt to clarify to the AHJ the designer's intent and interpretation of the code and standards. The AHJ can agree or disagree with the designer's interpretation. Historically, the requirements for fire protection and life safety systems have become site-specific, and building code requirements are not uniformly enforced. The size of the community, fire department staffing, fire department equipment availability, and suppression tactics established by the local fire department have affected the uniformity of enforcement. Site-specific requirements more or less than that of the building code can have reasonable intent; however, this type of enforcement in some cases has proven to be controversial in the applicability of code uniformity. The narrative can be and 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, which is uniformity and consensus in the interpretation of the codes and standards. The narrative should be written in a three-sectional format with subsections as necessary (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 B.

3.3.12 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 and operations phase.

3.3.13 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.

3.3.14 Phase.

3.3.14.1 Construction Phase. The phase during which the systems and materials are fabricated and installed, tested, and accepted.

3.3.14.2 Design Phase. The phase during which the basis of design is produced, and drawings and calculations, including those for design and fabrication, are produced, and testing procedures are developed.

3.3.14.3 Occupancy Phase. The phase during which the training and periodic inspection, testing, and maintenance are scheduled and performed.

3.3.14.4 Planning Phase. The phase during which the fire protection and life safety commissioning team is formed and initial project concepts and the owner's project requirements are developed.

3.3.15 Registered Design Professional (RDP). In commissioning, 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.

3.3.16* Sequence of Operation. A matrix, narrative, or table of system inputs and outputs that can be used to illustrate the interactions of interconnected fire protection systems.

A.3.3.16 Sequence of Operation. See Figure A.3.3.16(a) and Figure A.3.3.16(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.

3.3.17 Stakeholder. Any individual, group, or organization that might affect, be affected by, or perceive itself to be affected by the risk.

3.3.18 System.

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

A.3.3.18.1 Active Fire Protection System. Examples of active systems include, but are not limited to, gaseous extinguishing systems, sprinklers, standpipes, dampers, or fire alarm systems.

3.3.18.2 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, 2009]

3.3.18.3* Life Safety Systems. Those systems that enhance or facilitate evacuation, smoke control, compartmentalization, and/or isolation. [1031, 2009]

A.3.3.18.3 Life Safety Systems. Life safety systems can include both active and passive fire protection systems, devices, or assemblies. These systems are comprised of several items of equipment, processes, actions, or behaviors, grouped or interconnected so as to reduce injuries or death from fire or other life-threatening event.

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

A.3.3.18.4 Passive Fire Protection System. Examples of passive systems include, but are not limited to, 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.

3.3.19 System Connection.

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

A.3.3.19.1 Integrated System. 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, HVAC 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 HVAC 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.3.3.19.1 for examples of integrated systems.

****INSERT FIGURE HERE****

FIGURE A.3.3.19.1 Integrated System.

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

3.3.19.3* Interconnection. The physical connections between interconnected systems.

A.3.3.19.3 Interconnection. Interconnections could consist of electrical binary connections or data transfer protocols. Example of data transfers are BACnet or other data exchange protocols.

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

3.3.21 Test.

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

3.3.21.1 Acceptance Test. Tests performed on a completed installation to confirm compliance with applicable requirements.

3.3.21.2* Integrated Test. A test of integrated fire protection and life safety systems.

A.3.3.21.2 Integrated System Test. Integrated system testing can include other individual building systems integrated to fire and life safety systems such as elevator recall or HVAC control.

3.3.21.3* Pre-Functional Test. Tests performed prior to acceptance testing to confirm compliance with applicable requirements.

A.3.3.21.3 Pre-Functional Testing. Pre-functional testing is conducted in preparation for other types of testing, including integrated testing and acceptance testing. This testing is typically conducted according to a checklist developed by the FCxA 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, *Standard for the Installation of Stationary Pumps for Fire Protection*, this is required prior to acceptance testing, as the coordination of attendance by multiple members of the commissioning team may be required. Pre-functional testing is synonymous with the term *preliminary testing*.

Chapter 4 General

4.1 Goals.

4.1.1 The goal of this Standard is to establish a process that provides a reasonable degree of certainty that fire protection and life safety features and systems are designed, constructed and 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 documents and requirements for the Owner to verify the continued performance and operation of these systems.

4.2 Objectives.

Commissioning shall achieve the following:

- (1) Document the owner's project requirements (OPR) and the basis of design (BOD)
- (2) Document that equipment and systems have been installed as specified
- (3) Document successful completion of integrated systems testing for all integrated fire and life safety systems
- (4) Document delivery of operation and maintenance (O&M) documentation
- (5) * Document training requirements for facility operating and maintenance staff
- (6) Identify and document the requirements for maintaining system performance to meet the original design intent during the occupancy phase

4.3* Qualifications.

4.3.1 FCx Team. The members of the fire protection and life safety commissioning team shall have the necessary knowledge and experience to complete the commissioning process.

A.4.3.1 FCx Team. See Annex B, Qualifications of FCx Team Personnel.

4.3.2* FCxA

A.4.3.2 The FCxA should have no financial interest (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 this project. As such, qualified independent third-party firms or individuals should be considered for designation as the FCxA. The FCxA should have a minimum of five years' experience in facility construction, inspection, acceptance testing, or commissioning as it relates to fire protection and life safety.

Examples of individuals qualified to provide FCxA services can include, but are not limited to, the following individuals:

- (1) Registered professional fire protection engineers with sufficient knowledge in the applicable fire protection and/or life safety systems included as part of the commissioning process.
- (2) Registered professional engineers in other disciplines with sufficient knowledge in the applicable fire protection and/or life safety systems included as part of the commissioning process.
- (4) Professionals with sufficient knowledge in the design, operation, installation, inspection and/or testing of the type of fire and life safety systems included as part of the commissioning process.

4.3.2.1 The FCxA shall be knowledgeable and experienced in the proper application of commissioning requirements of this standard and general industry practices.

4.3.2.1.2 The FCxA shall be individually identified on the specifications or other enabling documentation.

4.3.2.1.3 The FCxA shall provide an objective and unbiased point of view.

4.4* Documentation and Forms.

4.4.1* Documentation.

Approved commissioning documents and forms shall be used to record commissioning and integrated testing of fire and life safety systems.

A.4.4.1 The forms shown in Annex D are examples of the documentation required by this standard.

4.4.2 Allowable Documents.

Documents from NFPA and other approved installation standards referenced in the BOD shall be utilized.

4.4.3 Forms and Checklists.

Where no form or checklist exists, specific forms or checklists shall be developed to document successful testing of systems and components.

4.4.4* Document Retention.

Test documents shall be retained by the owner for the life of the system.

A.4.4.4 The documents should be maintained at the site, but this might not always be practical. If the test documents are kept somewhere other than on site, then the owner should be knowledgeable of the storage method and location of the records.

Chapter 5 Commissioning

5.1 General.

5.1.1* This chapter provides the requirements for commissioning fire protection and life safety systems.

A.5.1.1 The fire protection and life safety commissioning team should review with the owner and AHJ to determine the systems that should be subject to commissioning. Commissioning might not be required for all facilities, systems, or components. However, integrated testing should still be performed. A reasonable degree of assurance that the systems will operate as designed can be provided by integrated testing for small systems or those integrated systems having simple logic. For examples of roles and responsibilities, see Table A.5.1.1.

5.1.2* 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.5.1.2(a), Figure A.5.1.2(b), and Figure A.5.1.2(c).]*

A.5.1.2 Figure A.5.1.2(a), Figure A.5.1.2(b), and Figure A.5.1.2(c) are offered to provide an example of how to perform a commissioning plan.

****INSERT FIGURE HERE****

FIGURE A.5.1.2(a) The Commissioning Process — Design Phase.

****INSERT FIGURE HERE****

FIGURE A.5.1.2(b) The Commissioning Process — Construction and Occupancy Phase.

****INSERT FIGURE HERE****

FIGURE A.5.1.2(c) The Commissioning Process — Ongoing Commissioning.

5.2 Planning Phase.

5.2.1 Activities.

5.2.1.1* The fire protection and life safety commissioning team shall be established during the planning phase.

A.5.2.1.1 The fire protection and life safety 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*. The individuals and entities listed are not all inclusive and should be modified on a project by project basis. If the entity listed 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 commissioning team. The number of members of the fire

protection and life safety commissioning team should be determined by project type, size, and complexity.

5.2.1.2 During the planning phase of the project, the fire protection and life safety commissioning team shall:

- (1) Develop the OPR in accordance with Section 5.2.
- (2) Select the FCxA.
- (3) Identify the commissioning scope.
- (4) Develop the preliminary commissioning plan in accordance with Section 5.2.
- (5) Review the planning documents in accordance with Section 5.2.
- (6)* Develop regulatory code analysis.

A.5.2.1.2(6) This analysis should involve making direct contact with the various federal, state, and local regulatory agencies to verify what laws, rules, regulations, codes, standards, policies, and practices are in force and applicable to the project.

- (7) Initiate the commissioning plan.

5.2.2* Fire Protection and Life Safety Commissioning Team. The fire protection and life safety commissioning team shall be identified and documented.

A.5.2.2 Fire protection and life safety commissioning team members should be selected as their role in the project is established.

5.2.2.1 The fire protection and life safety commissioning team shall, at a minimum, include the following members:

- (1) Owner
- (2) FCxA

A.5.2.2.1 Entities listed below, but not included as part of the project, should not be required to be part of the fire protection and life safety commissioning team. Other key team members will be identified and selected as the project progresses and as their roles and responsibilities require their participation. The exact size and members of the fire protection and life safety commissioning team can vary depending on project type, size, and complexity and may include the following additional members:

- (1) Commissioning authority
- (2) Installation contractor(s): The installation contractor may 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 may 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

(8) Third-party test entity

(10) AHJ: The definition of AHJ as set forth in 3.2.2 and A.3.2.2 provides information as to the large range of entities and individuals that can be an AHJ. Any and all AHJs should be included as part of the fire protection and life safety commissioning team to the extent they are deemed to need to be involved.

(11) ITa: See NFPA 4 for the responsibilities of the ITa. The responsibilities of an ITa can be fulfilled by the FCxA, if the FCxA also meets the ITa qualifications found in NFPA 4.

5.2.2.2*

5.2.2.3 The fire protection and life safety commissioning team members shall meet the requirements of Chapter 4.

5.2.2.4 Owner.

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

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

A.5.2.2.4.2 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.

5.2.2.4.3 The owner responsibilities shall 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 OPR

(3) Assigning operations and maintenance personnel to participate in the commissioning process

(4) Reviewing and accepting any changes to the OPR

- (5) Reviewing and accepting the construction documents
- (6) Reviewing and accepting commissioning process progress reports
- (7) Reviewing and accepting the fire protection and life safety commissioning team progress reports
- (8) Reviewing and accepting the final commissioning report

5.2.2.5* Commissioning Authority (CxA). The CxA shall be responsible for coordinating between the FCxA and the remainder of the building commissioning team, when applicable.

A.5.2.2.5 A CxA will only be part of the fire protection and life safety commissioning team when the fire protection and life safety systems are included in a larger building commissioning process. If the scope of the project includes fire protection and life safety systems only, then a CxA will not be present nor part of the fire protection and life safety commissioning team. In this instance, the role of the CxA can be fulfilled by the FCxA or vice versa.

5.2.2.6 Fire Commissioning Agent (FCxA). The FCxA responsibilities shall include, but not be limited to, the following:

- (1) Organize and lead the fire protection and life safety commissioning team.
- (2) Coordinate and attend fire protection and life safety commissioning team meetings.
- (3) Facilitate the development of and document the OPR.
- (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 pre-bid meeting to detail the commissioning contractor requirements.
- (11) Review and approve the O&Ms to compile the systems manual.
- (12) Track and document issues and deviations to the OPR 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 commissioning team report to the owner.

5.2.2.7 Installation Contractor. The installation contractor responsibilities shall include the following:

- (1) Provide commissioning process requirements and activities as specified in the construction documents.
- (2) Attend required fire protection and life safety 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 commissioning team.
- (6) Develop an individual system test plan, including acceptance and integrated testing.
- (7) Notify the general contractor, third-party test entity, and FCxA 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) Continuously maintain the record drawings as required by the construction documents.

5.2.2.8 Manufacturer's Representative. The manufacturer's representative responsibilities shall 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 commissioning team with installation verification and testing.
- (6) Assist in development and implementation of system training.

5.2.2.9 RDP. The RDP responsibilities shall include the following:

- (1) Participate and assist in the development of the OPR.
- (2) Create and document the basis of design.
- (3) Prepare construction documents.
- (4) Respond to the fire protection and life safety 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 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.

5.2.2.10 Construction Manager/General Contractor. The construction manager's/general contractor's responsibilities shall 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 commissioning team meetings.
- (4) Include commissioning process milestones in the project schedule.
- (5) Notify the FCxA 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 commissioning team during installation verification or testing.
- (8) Review and comment on the final commissioning record.

5.2.2.11* Insurance Representative. The insurance representative(s) responsibilities shall include the following services, as contracted with the owner:

A.5.2.2.11 Discussions should be performed between insurance representatives and the fire protection and life safety commissioning team during the planning phase to determine the overall scope of services to be provided by the insurance representative.

- (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 (CxT) meetings, as necessary, to ensure scope of project, responsibilities, and project timeline (including commissioning) is established/agreed to.
- (4) Visit project site during installation phase to review 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 CxT, as necessary.
- (7) Verify any issues detected during commissioning are resolved in timely and appropriate manner.
- (8)* Verify adequate training and documentation is provided for onsite personnel.

A.5.2.2.11(8) This includes adequate signage on equipment for operation of a fire protection system and complete record drawings.

- (9) Review final commissioning documentation.

5.2.2.12 Owner's Technical Support Personnel. The owner's technical support personnel's responsibilities shall include the following:

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

(8) Review the systems manual.

5.2.2.13 Third-Party Test Entity. The third-party test entity's responsibilities shall include the following:

- (1) Include all commissioning process requirements and activities in the scope of services.
- (2) Attend required fire protection and life safety commissioning team meetings.
- (3) Include commissioning process milestones in the project schedule.
- (4) Develop individual system test plan, including acceptance and integrated 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.

5.2.2.14 Facility Manager or Operations Personnel. The facility manager or operations personnel's responsibilities shall include the following:

- (1) Attend systems training sessions.
- (2) Review and comment on the OPR.
- (3) Review and comment on the systems manuals.
- (4) Organize, coordinate, and implement system inspection, testing, and maintenance as required by the systems manuals.

5.2.2.15 AHJ. The AHJ's responsibilities shall include the following:

- (1) Participate in fire protection and life safety 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 commissioning team, as necessary.
- (4) Identify AHJ personnel to attend training.

5.2.3 Owner's Project Requirements (OPR).

5.2.3.1 The OPR shall form the basis from which all design, construction, acceptance, and operational decisions are made.

5.2.3.2* The OPR shall be developed with input from the owner and all key facility users and operators.

A.5.2.3.2 OPR development should include the AHJ in order 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.

5.2.3.3* The OPR shall be documented at the planning stage of the project.

A.5.2.3.3 The OPR should include the following sections: introduction, owner's key project requirements (i.e., insurance underwriter's standards), general project description, project objectives, functional uses, occupancy requirements, budget considerations and limitations, performance criteria, and project history. The fire and life safety OPR can be a section of the overall building commissioning documentation. (*See Annex D for a sample OPR.*) The OPR is intended to be a living document that is regularly updated and modified. During the design phase the OPR can change significantly based on the needs of the proposed design.

5.2.3.3.1 Each item of the OPR shall have defined performance and acceptance criteria.

5.2.3.3.2 The OPR shall include, but not be limited to, the following:

- (1) Infrastructure requirements (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

5.2.3.4 The OPR shall be updated as required by the fire protection and life safety commissioning team throughout the planning, design, construction, and occupancy phases of the building life cycle.

5.2.4 Commissioning Plan.

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

5.2.4.2* The commissioning plan shall contain the following information:

- (1) Commissioning scope and overview specific to the project
- (2) General project information
- (3) Fire protection and life safety 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, including integrated testing
- (9) Recommended training
- (10) Establishment of an integrated testing frequency, as applicable

A.5.2.4.2 All information in the commissioning plan must be project specific. 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 OPR and project BOD
- (4) Team contacts — project-specific fire protection and life safety 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 timeframes, dates, and durations

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

(1) A — Owner's project requirements

(2) B — Basis of design

(3) C — Commissioning specifications

(4) D — Design review

(5) E — Submittal review

(6) F — Issues log

(7) G — Construction checklists

(8) H — Site visit and commissioning meeting minutes

(9) I — Systems manual review

(10) J — Training

(11) K — Integrated testing procedures

(12)* L — Warranty review

A.5.2.4.3(12) 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.

(13) M — Test data reports

(14) N — Sequence of operation

5.2.4.4 The commissioning plan, including all annexes, shall form the commissioning record at the end of the construction phase.

5.2.4.5 A current copy of the commissioning record shall be presented to the owner at the end of the construction phase.

5.2.5 Planning Review.

5.2.5.1 The FCxA shall review the planning documentation to compare the design concept with the interests and needs of the owner as defined in the OPR.

5.2.5.2 The FCxA shall identify required changes and improvements affecting operations and maintenance.

5.2.5.3 It shall not be the intent of the planning review to verify compliance with local, state and federal codes, unless specifically identified in the commissioning scope.

5.2.6 Planning Approval Documentation.

5.2.6.1 The FCxA shall submit documentation stating completion and recommending acceptance of the planning requirements to the owner or other designated individual.

5.2.6.2 The documentation shall include, but not be limited to, the following information:

- (1) Receipt, review, and approval of planning submittal
- (2) Updates to the commissioning plan, as applicable
- (3) Any additional comments or requests for information considered by the FCxA to be appropriate to the commissioning process
- (4) Preliminary sequence of operation

5.3* Design Phase.

A.5.3 Construction phase documents can be started during the design phase. These documents are intended to include working plans, shop drawings, or fabrication drawings, as well as operations and maintenance manuals. These documents can be created during the design or construction phases of a project without changing the responsibilities of those charged with creating these documents.

5.3.1* Design phase activities shall include, but not be limited to, the following:

A.5.3.1 If commissioning starts later in the design or construction process, the requirements of the previous commissioning phases should be reviewed and implemented to the extent practical.

- (1) Developing the BOD
- (2) Review and approval of the sequence of operation
- (3) Review of project drawings and calculations affecting fire protection and life safety systems
- (4)* Documentation of the scope for commissioning activities in the construction documents

A.5.3.1(4) 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.

- (5) Documentation of the commissioning procedures
- (6) Developing a commissioning schedule
- (7) Verifying that the construction documents comply with the requirements of the BOD
- (8) Identifying qualified specialists in accordance with Chapter e and their responsibilities
- (9) Coordinating and documenting fire protection and life safety commissioning team meetings and progress reports
- (10)* Documenting issues and changes

A.5.3.1(10) 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.

- (11) Updating the commissioning plan
- (12)* Developing construction checklists

A.5.3.1(12) Include checklists requiring when AHJs and Cx team members are to be present during acceptance testing.

5.3.2 Basis of Design.

5.3.2.1 General.

5.3.2.1.1 The basis of design shall be the documentation describing the initial design decision-making process and description of systems.

5.3.2.1.2 The document described in 5.3.2.1.1 shall be in the form of a narrative report and shall be submitted for review prior to the installation of any system.

5.3.2.1.3 The basis of design shall include but not be limited to 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) Referenced codes and standards
- (5) Alternative means and methods incorporated into the original design
- (6) Testing and start-up requirements
- (7) Inspection, testing, and maintenance requirements

5.3.2.1.4 The BOD shall be included with other required submittals to facilitate plan review and approval by the AHJ prior to the issuance of a permit to install the system.

5.3.2.1.5 The BOD shall be updated in accordance with the requirements for OPR in 5.2.3 after every revision of the design documents.

5.3.2.1.6 The outline for the BOD shall include the items in 5.3.2.2 through 5.3.2.7.

5.3.2.2* Applicable Standards, Laws, and Regulations. This section shall 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.

A.5.3.2.2 Editions referenced in this document are the latest available during the development of this standard. The user should always consult the AHJ to ensure compliance with local requirements.

5.3.2.2.1 All codes and standards referenced and utilized in the design of each fire protection/life safety system shall 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

5.3.2.3 Building Description. The following specific features of fire protection and life safety systems shall be identified in the BOD:

- (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

5.3.2.4 Fire Protection and Life Safety System Objectives and Decisions.

5.3.2.4.1 The BOD performance objectives of each fire protection and life safety system shall 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 another pre-existing system

5.3.2.4.2 The BOD shall describe the decisions made and the criteria established to achieve the performance objectives, including, but not limited to, 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
- (6) Methods for inspection, testing, and maintenance of systems

5.3.2.5 Consideration and Description of Alternative Means and Methods. The design intent of any alternatives to prescriptive requirements of the codes and standards, including, but not limited to, the following, shall be identified:

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

5.3.2.6 Testing Criteria.

5.3.2.6.1 The FCxA shall be responsible for all items listed in 5.3.2.6.

5.3.2.6.2 Testing criteria shall be established and documented.

5.3.2.6.3 The methods for prefunctional and integrated testing shall be documented.

5.3.2.7* Equipment and Tools. The FCxA shall identify and document the tools and equipment necessary for testing.

A.5.3.2.7 FCxA should review manuals, standards, manufacturers' documents, and other sources to determine the equipment and tools necessary for each phase of testing. FCxA should also confirm which

contractors or other appropriate parties should calibrate and schedule the availability of the tools and equipment for the testing dates.

5.3.3 Operation and Maintenance Manuals (O&Ms).

5.3.3.1 O&Ms shall be provided.

5.3.3.2 O&Ms shall contain, but not be limited to, the following information:

- (1) Project name and address
- (2) Discipline (i.e., fire protection)
- (3) Specification section number
- (4) Volume number

5.3.3.3* The RDP shall review and approve the O&Ms for conformance with the OPR.

A.5.3.3.3 O&Ms 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.

O&Ms should be of durable materials and contain complete project identification including, but not limited to, the following:

- (1) Title sheet including the complete name and address of the project and the complete name and address of the installing contractor (including telephone number for emergency service)
- (2) Complete table of contents
- (3) Systems design intent documentation
- (4) Complete list of equipment
- (5) List of equipment suppliers and/or manufacturers
- (6) Operation and maintenance instructions for major components
- (7) Inspection and test reports
- (8) Recommended spare parts
- (9) Riser diagrams or schematic drawings
- (10) "As-built" drawings and calculations
- (11) Warranty

- (12) Other special requirements of the installation specification or installation standard such as valve tags and charts, hydraulic data nameplate information (for sprinkler systems), and so forth

5.3.4 Training of Operations Personnel. The content, duration, and learning outcomes of training for operations personnel shall be provided in the design documentation in accordance with Section 5.3.

5.3.5 Design Methodology.

5.3.5.1* The design shall take into consideration commissioning of the active and passive fire protection systems.

A.5.3.5.1 Passive fire protection systems include, but are not limited to, the following:

- (1) Fire and smoke dampers
- (2) Fire and smoke doors
- (3) Through penetration fire stops
- (4) Smoke vents
- (5) Smoke drafts
- (6) Smoke and fire assemblies

5.3.5.2 Design consideration shall include, but not be limited to, the following:

- (1) Materials and equipment applied in such a manner that will not affect their listing or their intended use where applicable
- (2) Materials and equipment have the capacity to perform their intended use
- (3) Design documents or details to demonstrate how the systems operate and communicate to attain the desired outcome
- (4) Design documents and/or details to demonstrate the application of fire protection systems in the construction
- (5) Locations of fire protection systems
- (6) The procedures for verification of fire protection systems
- (7) Assignment of responsibility for the testing and inspection of the fire protection systems during the construction phase
- (8) Specification of the deliverables, including final documentation for the conclusion of the project
- (9) Specification of the format of the deliverables

5.4 Construction Phase. During the construction phase the systems shall be delivered, installed, and tested in accordance with the OPR, construction documents, shop drawings, and coordination drawings.

5.4.1 Construction Phase Commissioning Activities.

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

- (1) Confirm that the commissioning schedule is still valid, and update if required.
- (2) Verify that submittals, including, but not limited to, working plans and product data sheets, are in conformance with the BOD and have been reviewed.
- (3) Verify that materials, construction, and installation are in conformance with the BOD.
- (4) Confirm qualified specialists are performing commissioning activities per commission plan (CP).
- (5) Coordinate and document fire protection and life safety commissioning team meetings and progress reports.
- (6) Document any issues and changes to the project and update the CP.
- (7) Complete Cx construction checklists.
- (8) Perform required observation procedures or cause them to be performed by the responsible party.
- (9) Update related documents to record and adjust for any revisions and/or changes.
- (10) Verify and document testing performed in the construction phase.

5.4.1.2 Construction shall take into consideration commissioning of the passive fire protection systems.

5.4.1.3 The requirements for installation shall include, but not be limited to, the following:

- (1) Conformance to the approved drawings and specifications
- (2) Compliance with the manufacturers' published instructions
- (3) Compliance with applicable codes and standards
- (4) Materials and equipment of proper rating for the use

5.4.2 Construction Inspections.

5.4.2.1 Pre-Installation or Preconstruction.

5.4.2.1.1 A preconstruction conference shall be held to ensure the fire protection and life safety commissioning team and those performing the work all understand the schedule, procedures, and process.

5.4.2.1.2 Schedule commissioning process activities shall include the following:

- (1) Address any outstanding issues that are best resolved in this venue.
- (2) Verify coordination has taken place among trades.
- (3) Identify and establish benchmarks to be met during the construction phase.
- (4) Verify submittals are in accordance with design intent documents and approvals and permits are secured.
- (5) Confirm integrated testing requirements are being addressed.
- (6) Develop test data records.
- (7) Confirm compliance with sequence of operation.

5.4.2.2 Rough-In Phase. The following tasks shall be performed prior to concealment of the installed material:

- (1) Inspect and verify delivered materials meet requirements.
- (2) Verify installation is proceeding in accordance with coordinated, approved shop drawings.
- (3) Complete periodic site visits to verify compliance with the owner's commissioning plan.
- (4) Inspect installation as outlined in the commissioning plan.
- (5) Perform testing as applicable.
- (6) Update owner project requirements and address any outstanding issues.
- (7) Update commissioning plan as needed.
- (8) Issue rough-in phase commissioning progress report.

5.4.2.3 Finish Phase. The following tasks shall be performed after the rough-in phase is complete:

- (1) Inspect and verify delivered materials meet requirements.
- (2) Verify installation is proceeding in accordance with coordinated, approved shop drawings.
- (3) Complete periodic site visits to verify compliance with OPR.
- (4) Inspect installation as outlined in the commissioning plan.
- (5) Perform testing as applicable (post-concealment).
- (6) Update OPR and address any outstanding issues.

(7) Update commissioning plan.

(8) Issue finish phase commissioning progress report.

5.4.3 Testing and Inspection.

5.4.3.1 Testing and inspection shall include passive fire protection systems.

5.4.3.2* Fire protection systems that have no operating components should be inspected to verify conformance with the BOD.

A.5.4.3.2 Examples of fire protection systems with no operating components include, but are not limited to, the following:

- (1) Through-penetration firestop systems
- (2) Rated fire and smoke assemblies
- (3) Spray-applied fire-resistant material

5.4.3.3 Fire protection systems that have operating components shall have their functionality tested to demonstrate compliance with the BOD.

5.4.3.4 Written documentation of the testing and inspection shall be provided.

5.4.3.5 Inspection and testing shall be repeated if changes are made to systems.

5.4.3.6 Testing and inspection of passive fire protection systems shall be completed as required during construction.

5.4.4 Completion and Acceptance Testing. The following tasks shall be performed as part of the acceptance of the fire protection and life safety systems:

- (1) Verify installation is in accordance with coordinated, approved shop drawings.
- (2) Inspect overall installation as outlined in the commissioning plan.
- (3) Perform prefunctional testing of all systems to provide proper functionality and to ensure interoperability.
- (4) Perform and document testing of all systems to provide proper functionality, to ensure integration, and to ensure the systems were left in a state of operational readiness.
- (5) Update owner project requirements and address any outstanding issues.
- (6) Update commissioning plan/record.
- (7) Issue completion/acceptance phase commissioning progress report.

(8) Verify compliance and accuracy of sequence of operation.

5.4.5* Owner Training. Training shall be permitted to take place in the construction phase.

A.5.4.5 Training often needs to begin in the construction phase; however, some systems can require ongoing training during the occupancy and post-construction phases.

5.4.6* Closeout Documents. Closeout documents shall include, but not be limited to, the following:

A.5.4.6 This can include documents required by other codes and standards or by AHJs.

- (1) Compiled list of all deficiencies and resolutions and verification of resolution achieved
- (2) Operations and maintenance manuals
- (3) Compile test results and certificate
- (4) As-built drawings
- (5) Warranty and extended warranties
- (6) Spare parts list and supplier listings
- (7) Re-commissioning plan (integrated testing)
- (8) Sequence of operation

5.5 Occupancy Phase.

5.5.1 Occupancy phase shall be the final stage of the commissioning process for the fire protection or life safety systems.

5.5.2 The requirements for occupancy phase shall include but not be limited to the following:

- (1) Documentation and completion of remaining acceptance testing and inspections
- (2) Testing conducted for modifications made during the construction phase commissioning
- (3)* Performing deferred testing for seasonal conditions

A.5.5.2(3) For example, it can be appropriate to test stair pressurization in both winter and summer conditions.

- (4) Submission of the system manual, operation and maintenance manuals, and vendor emergency contact list
- (5) Training on the use and operation of the fire protection and life safety systems
- (6) Delivery of the record set drawings and documents

(7) Delivery of the test and inspection records for the fire protection and life safety systems

(8)* Delivery of a digital copy of site-specific software for fire protection and life safety systems that is current with the installed system

A.5.5.2(8) This would include a digital copy of site-specific software for building automation or other integrated systems.

(9)* Delivery of warranties for the systems and equipment

A.5.5.2(9) The building owner or a designated representative should police the building systems through inspection, testing, and maintenance prior to the expiration of the warranty. This helps identify needed repairs.

(10) Submission of recommended preventative maintenance program for fire protection and life safety systems

(11) Delivery of a list of required inspections, tests, and maintenance for fire protection and life safety systems

5.5.3 Administrative Controls. The owner shall be responsible for the continued performance of fire protection and life safety systems.

5.5.3.1* Applicable inspection and testing shall be performed when modifications are made.

A.5.5.3.1 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.

5.5.3.2* When changes are made to the use of the facility, the OPR shall be re-evaluated.

A.5.5.3.2 Significant changes to the OPR can precipitate a need to do a re-commission process.

5.5.3.3* The design documents shall be maintained for future reference.

A.5.5.3.3 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.

5.5.3.4 Inspection, testing, and maintenance shall be performed as specified in the installation standard or manufacturer's instructions.

5.5.3.5 Integrated systems shall be inspected, tested, and maintained in accordance with the commissioning plan.

5.5.4 Training.

5.5.4.1* Training shall include, but not be limited to, the following:

- (1) The systems, component systems, and devices for which training will be required
- (2) The capabilities and knowledge of the occupants and maintenance personnel
- (3) The number and type of training sessions
- (4) The location and organization of operation and maintenance manuals

A.5.5.4.1 A quality training session for system operation and maintenance will generally include the following components:

- (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.

5.5.4.2* Systems training shall be scheduled to be completed at or as close as possible to final systems acceptance.

A.5.5.4.2 An appropriate time to schedule the initial training is at system acceptance in order to maximize its value to the participants. Secondary systems training should be held after integrated testing has been completed to allow follow-up questions and the opportunity to ask questions about situations and problems that have occurred after final acceptance.

5.5.4.3* Training session scope and attendees shall be documented as part of the commissioning record.

A.5.5.4.3 Sign-in sheets are useful for the contractor and fire protection and life safety commissioning team to demonstrate that training was conducted. Training sessions can be recorded to allow for future reference of the material and training for new employees.

5.5.4.4* Facilities personnel or their designated representatives shall receive periodic re-training as determined by the commissioning agent.

A.5.5.4.4 Continuous training can ensure the systems are maintained and tested properly and the building or structure operates successfully.

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 this section shall apply for systems that followed the FCx process through design, construction and occupancy phases only when the original OPR or BOD documents are available. Refer to the provisions of this chapter for Retro-commissioning (RCx) when the original OPR or BOD documents are unavailable.

6.2.2* Re-Cx shall be performed at the following intervals.

- (1) When specified in the FCx plan
- (2) Upon change of occupancy,
- (3) Upon change of hazard of the facility
- (4) Upon a change of fire protection and life safety systems.

6.2.2. 1 Where any of the items listed in 8.2.4, other than the OPR or BOD are unavailable, they shall be developed by the FCx team utilizing as much historical information as position with the OPR and BOD as the basis for any assumptions.

6.2.3 The following shall be achieved during Re-Cx:

- (1)* A fire protection and life safety team should be established and responsibilities assigned in accordance with 5.2.2.
- (2)* The original OPR and BOD should be reviewed by the FCx team against current facility operational conditions. If the OPR and/or BOD do not match the current facility operational conditions, the OPR and/or BOD should be updated to meet current conditions. This should include any updates to the sequence of operation.
- (3) The original design and installation drawings should be reviewed to gain familiarity with the individual systems and overall fire protection and life safety sequence for the facility.
- (4) The original FCx plan should be reviewed and modified based on any revisions to the OPR and/or BOD.
- (5) The original construction checklists and functional performance tests should be reviewed and modified based on any revisions to the OPR and/or BOD.
- (6)* Functional performance testing of the existing fire protection and life safety systems should be performed as described in the FCx plan. This testing should include verification of the sequence of operation matrix.

- (7) The original systems manuals and record drawings should be reviewed for completeness and quality of materials.
- (8) Knowledge of the operation and maintenance of fire protection and life safety systems by on-site personnel should be assessed to determine if additional training is required.
- (9) A Re-Cx report should be developed and forwarded to the Owner for review.

8.2.3.1 The Re-Cx report shall include the following information:

- (1) Scope and overview of the Re-Cx process.
- (2) List of fire protection and life safety commissioning team members including role and contact information.
- (3) Updated OPR and BOD. If no changes were made, the original OPR and BOD should be included.
- (4) Updated FCx plan including any revisions to frequency of future Re-Cx and/or integrated 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.

6.3.1* RCx shall only performed for systems that were not designed and installed following the FCx process noted in this document.

6.3.2* RCx shall be performed at the following intervals:

- (1) When design, installation or operational issues are revealed during inspection, testing, and maintenance
- (2) Upon change of occupancy,
- (3) Upon change of hazard of the facility
- (4) Upon a change of fire protection and life safety systems.

8.3.3 The following shall be achieved during RCx:

- (1)* A fire protection and life safety commissioning team should be established and responsibilities assigned in accordance with 5.2.2.
- (2)* An OPR should be developed by the FCx team in consultation with the Owner. The OPR should meet 5.2.3.3.2 as applicable to the existing building.

- (3)* A BOD should be developed by the FCx team based on available historical information. The BOD should meet 5.3.2.1.3 as much as applicable to the existing building.
- (4) Any design or installation drawings should be reviewed to gain familiarity with the individual systems and overall fire protection and life safety sequence for the facility.
- (5) A sequence of operation matrix should be developed based on the information provided in the OPR and/or BOD as well as an understanding of the system's current function.
- (6) A RCx plan should be developed following 5.2.4.2 as applicable for the existing systems.
- (7) Functional performance tests should be developed based on the current OPR, BOD and sequence of operation matrix.
- (8)* Functional performance testing of the existing fire protection and life safety systems should be performed as described in the RCx plan. This testing should include verification of the sequence of operation matrix.
- (9) The original systems manuals and record drawings should be reviewed for completeness and quality of materials.
- (10) Knowledge of the operation and maintenance of fire protection and life safety systems by on-site personnel should be assessed to determine if additional training is required.
- (11) A RCx report should be developed and forwarded to the Owner for review.

6.3.3.1 The RCx report shall include at a minimum the following information:

- (1) Scope and overview of the RCx process.
- (2) List of fire protection and life safety commissioning team members including role and contact information.
- (3) Current OPR, BOD and sequence of operation, as developed by the FCx team.
- (4) RCx plan including any frequency of future Re-Cx and/or integrated 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.

A.6.2.1 If any of the remaining original items noted in 8.2.3 are unavailable, they should be developed by the FCx team utilizing as much historical information as possible with the OPR and/or BOD as the basis for any assumptions.

A.6.2.2 Re-Cx should be considered where expansion, improvement, or addition to an existing structure changes the original OPR and/or BOD. For example, an existing manufacturing facility utilizes a combination of automatic sprinklers and local application dry chemical fire suppression systems. The

FCx process, as outlined in this document, was followed through design, construction and occupancy. The owner has elected to replace some of the existing manufacturing lines with a new process. This process has the potential to change the OPR and BOD, therefore, the fire protection and life safety systems should follow Re-Cx to update/modify the original OPR and BOD and verify that the systems will function as intended.

The scope of the Re-Cx process should be evaluated by the FCx 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 fire and life safety systems. In this scenario, Re-Cx would not need to be performed. If that smoke detector, however, is connected to the elevator recall system via direct contact, the elevator recall system would be affected by this change. In this scenario, the fire alarm and elevator recall system should be included in partial Re-Cx. If that connection, however, is via control module, then replacement of the smoke detector would not impact the operation of the elevator recall system. Therefore, in that scenario, Re-Cx would not need to be performed.

A.6.2.3(1) The scope and extent of the FCx team may be significantly limited based on the number of systems and their age. For example, it may be difficult to locate the original installation contractor or, if located, no one may be familiar with the original installation. In this instance, the original installation contractor may not provide value to the FCx team. The same could be said for the general contractor. Only those members who will provide value, either via historical knowledge or technical information, need to be included on the FCx team.

A.6.2.3(2) Care should be taken to ensure that revisions to the OPR and/or BOD 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-Cx does not require the systems to be modified to meet the current edition of a code or standard unless that hazard has changed or as required by the AHJ or Owner.

A.6.2.3(6) Functional performance testing may be performed on a sampling basis, if noted in the FCx plan. The purpose of Re-Cx 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 OPR, BOD or facility, then sampling may be an appropriate method to verify proper functionality. If changes have occurred to the OPR, BOD or facility, complete functional performance testing, as was performed during initial FCx, may be appropriate. This determination should be made by the FCx team.

A.6.2.3(8) The extent of the required knowledge should be determined by the FCx team. For many facilities, simply understanding the audible and visual notification appliances and local shutdown procedures may be adequate for most occupants. On-site inspection, maintenance and testing staff would need a more detailed knowledge of the system and sequence of operation.

A.6.3.1 As noted previously, RCx is performed when the FCx process was not followed during design, construction and occupancy. Information required for RCx 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 RCx 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 FCx, as outlined in this document, was utilized during the design and installation of the fire protection system. RCx 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.

Since documentation on existing systems is typically not available in a RCx scenario, the FCx team must devote a significant amount of time reviewing as much historical information as possible. The Owner should not expect an FCxA to simply walk into a building and begin functional performance testing with no knowledge of the OPR, BOD or sequence of operations. For example, in a 30-story high-rise office building with a voice evacuation system, an FCxA 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.6.3.3(1) The scope and extent of the FCx team may be significantly limited based on the number of systems and their age. For example, it may be difficult to locate the original installation contractor or, if located, no one may be familiar with the original installation. In this instance, the original installation contractor may not provide value to the FCx team. The same could be said for the general contractor. Only those members who will provide value, either via historical knowledge or technical information, should be included on the FCx team.

A.6.3.3(2) Since an OPR is not typically available during for systems in RCx, the FCx team should develop the OPR through dialogue with the Owner and/or other stakeholders. Historical documentation, to the extent available, should be reviewed in an attempt to determine the original OPR. This should then be compared to the current operational needs.

Care should be taken to ensure that any revisions to the assumed original OPR 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, RCx does not require the systems to be modified to meet the current edition of a code or standard unless that hazard has changed or as required by the AHJ or Owner.

A.6.3.3(3) Technically, this document will not be a true basis of design as it was not developed by the registered design professional responsible for the original system design. That said, a BOD must be developed to not only fully understand the current system intent but also for future FCx activities. The older systems become, the less historical data is available for review. By documenting the assumed BOD as early in the life of the systems as possible, both the FCx team and the Owner will gain a better understanding of the system intent and whether it meets the current OPR.

A.6.3.3(8) Functional performance testing may be performed on a sampling basis if noted in the RCx plan. The purpose of RCx is to verify that the existing fire protection and life safety systems meet the performance noted in the original (assumed) BOD as modified by the current OPR. The determination of the extent of sampling should be made by the fire protection and life safety commissioning team.

A.6.3.3(10) The extent of the required knowledge should be determined by the FCx team. For many facilities, simply understanding the audible and visual notification appliances and local shutdown

procedures may be adequate for most occupants. On-site inspection, maintenance and testing staff would need a more detailed knowledge of the system and sequence of operation.

A.6.3.2 RCx 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 FCx, as outlined in this document, was utilized during the design and installation of the fire protection system. RCx 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.

Since documentation on existing systems is typically not available in a RCx scenario, the FCx team must devote a significant amount of time reviewing as much historical information as possible. The Owner should not expect an FCxA to simply walk into a building and begin functional performance testing with no knowledge of the OPR, BOD or sequence of operations. For example, in a 30-story high-rise office building with a voice evacuation system, an FCxA 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.6.3.3(1) The scope and extent of the FCx team may be significantly limited based on the number of systems and their age. For example, it may be difficult to locate the original installation contractor or, if located, no one may be familiar with the original installation. In this instance, the original installation contractor may not provide value to the FCx team. The same could be said for the general contractor. Only those members who will provide value, either via historical knowledge or technical information, should be included on the FCx team.

A.6.3.3(2) Since an OPR is not typically available during for systems in RCx, the FCx team should develop the OPR through dialogue with the Owner and/or other stakeholders. Historical documentation, to the extent available, should be reviewed in an attempt to determine the original OPR. This should then be compared to the current operational needs.

Care should be taken to ensure that any revisions to the assumed original OPR 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, RCx does not require the systems to be modified to meet the current edition of a code or standard unless that hazard has changed or as required by the AHJ or Owner.

A.6.3.3(3) Technically, this document will not be a true basis of design as it was not developed by the registered design professional responsible for the original system design. That said, a BOD must be developed to not only fully understand the current system intent but also for future FCx activities. The older systems become, the less historical data is available for review. By documenting the assumed BOD as early in the life of the systems as possible, both the FCx team and the Owner will gain a better understanding of the system intent and whether it meets the current OPR.

A.6.3.3(8) Functional performance testing may be performed on a sampling basis if noted in the RCx plan. The purpose of RCx is to verify that the existing fire protection and life safety systems meet the performance noted in the original (assumed) BOD as modified by the current OPR. The determination of the extent of sampling should be made by the fire protection and life safety commissioning team.

A.6.3.3(10) The extent of the required knowledge should be determined by the FCx team. For many facilities, simply understanding the audible and visual notification appliances and local shutdown procedures may be adequate for most occupants. On-site inspection, maintenance and testing staff would need a more detailed knowledge of the system and sequence of operation.

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.

Table A.5.1.1 Roles and Responsibility Matrix

	Facility Manager or Operations Owner	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	L/A	S	—	S	—	—	—	—

responsibilities in
architect/engineer and
construction manager
scope of services

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
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
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

A.5.1.2 Figure A.5.1.2(a), Figure A.5.1.2(b), and Figure A.5.1.2(c) are offered to provide an example of how to perform a commissioning plan.

****INSERT FIGURE HERE****

FIGURE A.5.1.2(a) The Commissioning Process — Design Phase.

****INSERT FIGURE HERE****

FIGURE A.5.1.2(b) The Commissioning Process — Construction and Occupancy Phase.

****INSERT FIGURE HERE****

FIGURE A.5.1.2(c) The Commissioning Process — Ongoing Commissioning.

Note to Editor: Insert Annex B and re-letter existing annexes.

ANNEX B: Qualifications of FCx Team Personnel

B.1.1 Applicability. Members of the fire protection and life safety commissioning team should meet the requirements of this annex.

B.1.2 Qualifications.

B.1.2.1 Fire Commissioning Agent (FCxA).

B.1.2.1.1 General

The FCxA should have no financial interest (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 this project. As such, qualified independent third-party firms or individuals should be considered for designation as the FCxA. The FCxA should have a minimum of five years' experience in facility construction, inspection, acceptance testing, or commissioning as it relates to fire protection and life safety.

B.1.2.1.2 Requisite Knowledge. A qualified FCxA 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 system integrated testing.

B.1.2.1.3 Requisite Skills. An FCxA 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 have the ability to resolve conflicts.

B.1.2.2 Installation Contractor. When required by the local jurisdiction, installation contractors should be licensed and/or certified to perform the work.

B.1.2.2.1 Installation contractors should be knowledgeable and experienced in the installation of the type of system proposed to be installed.

B.1.2.2.2 The installation contractor should submit evidence of required license or certification to the FCxA when required by the jurisdiction. Installation contractors should be certified by an organization responsible for certification of technical installation personnel and approved by the AHJ.

B.1.2.3 Registered Design Professional (RDP).

B.1.2.3.1 The RDP should be individually identified in the specifications or other enabling documentation.

B.1.2.3.2 Requisite Knowledge. A qualified RDP should have comprehensive knowledge of the following:

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

B.1.2.4 Construction Manager and General Contractor. Construction managers and general contractors should be knowledgeable and experienced in the field of 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

This 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.1.2.5 Facilities Management Personnel. Facilities management personnel should include building maintenance and service personnel, building engineering personnel, and similar job functions.

B.1.2.5.1 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.1.2.5.2 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.1.2.5.3 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.1.2.5.4 Facilities management personnel who will be 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.1.2.6 Third-Party Test Entity.

B.1.2.6.1 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 system integrated testing.

B.1.2.6.2 Third-party test entities should be licensed or certified where required by the AHJ and/or codes and standards.

B.1.2.6.3 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, verbal, conflict resolution, and organizational skills.

B.1.2.7 Authority Having Jurisdiction (AHJ). Governmental AHJs (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 (HVAC) 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, and/or fire codes of the jurisdiction.

B.1.2.7.1 The AHJ should be knowledgeable in the applicable codes, ordinances, and standards as they relate to the fire protection and life safety systems installed.

B.1.2.7.2 The AHJ should have the ability to interface with the RDP and the commissioning authority in all phases of the commissioning process.

B.1.2.7.3 The AHJ should have the ability to determine the operational readiness of the fire protection and life safety systems installed.

B.1.2.7.4 The AHJ should have the ability to interface with the fire protection and life safety commissioning team in order to verify completion of integrated testing for the purpose of system acceptance.

B.1.2.8 Integrated Testing Agent (ITa).

B.1.2.8.1 The ITa should meet the qualifications found in NFPA 4.

B.1.2.9 Insurance Representative. The insurance representative should be knowledgeable and experienced in property loss prevention and life safety to mitigate possible risk.