SECTION 210800 - COMMISSIONING OF FIRE SUPPRESSION

Revise this Section by deleting and inserting text to meet Project-specific requirements.

1. GENERAL
	* + 1. SUMMARY
				1. Section includes Cx process requirements for the following fire-suppression systems, assemblies, and equipment:

Retain or add systems below that will be commissioned. Coordinate subparagraphs with retained "Construction Checklists" Article under Part 3.

Water-based fire-suppression systems.

Fire-extinguishing systems.

Fire pumps.

Fire-suppression water storage.

<**Insert additional systems**>.

* + - * 1. Related Requirements:

Retain first subparagraph below because it contains the general Cx process requirements that apply to Cx of fire-suppression systems. If the work covered under Section 019113 "General Commissioning Requirements" is not to be performed by an independent contractor, it must be included under this or other sections of the Specification. Modify the Specifications accordingly.

Section 019113 "General Commissioning Requirements" for general Cx process requirements and CxA responsibilities.

For construction checklists, comply with requirements in various Division 21 Sections specifying fire-suppression systems, system components, equipment, and products.

* + - 1. DEFINITIONS

Retain terms that remain after this Section has been edited for a project. Include only essential definitions or acronyms not well understood by the affected industry or trade.

* + - * 1. Cx: Commissioning, as defined in Section 019113 "General Commissioning Requirements."
				2. CxA: Commissioning Authority, as defined in Section 019113 "General Commissioning Requirements."
				3. IgCC: International Green Construction Code.
				4. "Systems," "Assemblies," "Subsystems," "Equipment," and "Components": Where these terms are used together or separately, they shall mean "as-built" systems, assemblies, subsystems, equipment, and components.
			1. SUBMITTALS
				1. Submittals for this section are subject to the re-evaluation fee identified in Article 4 of the General Conditions.
				2. Manufacturer's installation instructions shall be provided along with product data.
				3. Submittals shall be provided in the order in which they are specified and tabbed (for combined submittals).
				4. Construction Checklists:

Retain one of two subparagraphs below. Retain first subparagraph for projects in which an independent CxA creates construction checklists. Retain second subparagraph for projects in which Contractor creates and submits construction checklists. Note that in order to conform to IgCC requirements, construction checklists must be prepared by the CxA who must be designated by the Director’s Representative to manage the Cx process. CxA must have the necessary training, experience, and equipment and be independent from the design team and the Contractor.

Draft Cx plan, including draft construction checklists to be prepared by CxA under Section 019113 "General Commissioning Requirements." Contractor is to review Construction Checklist in accordance with requirements in Section 019113 "General Commissioning Requirements" and NFPA 3 “Standard for Commissioning of Fire Protection and Life Safety Systems” and to resolve any issues with the CxA.

Cx plan, including material, installation, and performance construction checklists for systems, assemblies, subsystems, equipment, and components relating to fire-suppression system to be part of the Cx process and in accordance with requirements in Section 019113 "General Commissioning Requirements" and NFPA 3 “Standard for Commissioning of Fire Protection and Life Safety Systems”.

Retain "Test Equipment and Instruments" Paragraph below if Contractor is to provide test equipment.

* + - * 1. Test Equipment and Instruments: For all test equipment and instruments to be used in conducting Cx tests by Contractor, provide the following:

Equipment/instrument identification number.

Planned Cx application or use.

Manufacturer, make, model, and serial number.

Calibration history, including certificates from agencies that calibrate the equipment and instrumentation.

Equipment manufacturers' proprietary instrumentation and tools. For each instrument or tool, identify the following:

Instrument or tool identification number.

Equipment schedule designation of equipment for which the instrument or tool is required.

Manufacturer, make, model, and serial number.

Calibration history, including certificates from agencies that calibrate the instrument or tool, where appropriate.

* + - 1. QUALITY ASSURANCE
				1. Fire-Suppression Testing Technician Qualifications: Technicians to perform fire-suppression Construction Checklist verification tests, Construction Checklist verification test demonstrations, Cx tests, and Cx test demonstrations shall have the following minimum qualifications:

Journey level or equivalent skill level with knowledge of fire-suppression system, electrical concepts, and building operations.

Minimum [**three years'**] <**Insert time**> experience installing, servicing, and operating systems manufactured by approved manufacturer.

* + - * 1. Clean-Agent Fire-Suppression Systems Testing Technician Qualifications: Technicians to perform clean-agent fire-suppression system Construction Checklist verification tests, Construction Checklist verification test demonstrations, Cx tests, and Cx test demonstrations shall have the following minimum qualifications:

Journey level or equivalent skill level. Vocational school four-year-program graduate or an Associate's degree in mechanical systems, fire-suppression systems, or similar field. Degree requirement may be offset by three years' experience in servicing fire-suppression systems in the clean-agent fire-suppression systems industry. Generally, required knowledge includes clean-agent fire-suppression systems, electrical concepts, building operations, and application and use of tools and instrumentation to measure performance of fire-suppression system equipment, assemblies, and systems.

Minimum [**three years'**] <**Insert time**> experience installing, servicing, and operating systems manufactured by approved manufacturer.

* + - * 1. Testing Equipment and Instrumentation Quality and Calibration:

Capable of testing and measuring performance within the specified acceptance criteria.

Be calibrated at manufacturer's recommended intervals with current calibration tags permanently affixed to the instrument being used.

Be maintained in good repair and operating condition throughout duration of use on Project.

Be recalibrated/repaired if dropped or damaged in any way since last calibrated.

* + - * 1. Proprietary Test Instrumentation and Tools:

Equipment Manufacturer's Proprietary Instrumentation and Tools: For installed equipment included in the Cx process, test instrumentation and tools manufactured or prescribed by equipment manufacturer to service, calibrate, adjust, repair, or otherwise work on its equipment or required as a condition of equipment warranty, shall comply with the following:

Be calibrated by manufacturer with current calibration tags permanently affixed.

Include a separate list of proprietary test instrumentation and tools in operation and maintenance manuals.

Fire-suppression system proprietary test instrumentation and tools become property of Director’s Representative at the time of Substantial Completion.

1. PRODUCTS (Not Used)
2. EXECUTION
	* + 1. Cx PROCESS
				1. Perform Cx process for fire-suppression system in accordance with the following:

Section 019113 "General Commissioning Requirements."

NFPA 3 “Standard for Commissioning of Fire Protection and Life Safety Systems”.

[**IgCC, which requires compliance with ASHRAE 202.**]

[**Cx standards acceptable to the authority having jurisdiction.**]

<**Insert standard**>.

* + - 1. CONSTRUCTION CHECKLISTS

Retain first paragraph below if construction checklists are to be prepared under Section 019113 "General Commissioning Requirements." Coordinate with "Construction Checklists" Paragraph in "Informational Submittals" Article.

* + - * 1. Preliminary detailed construction checklists are to be prepared under Section 019113 "General Commissioning Requirements" for each fire-suppression system, assembly, subsystem, equipment, and component required to be commissioned, as detailed in NFPA 3 “Standard for Commissioning of Fire Protection and Life Safety Systems” [**and IgCC**] <**Insert Cx standard**>. Contractor performs the following:

Review fire-suppression system preliminary construction checklists and provide written comments on Construction Checklist items where appropriate.

Return preliminary Construction Checklist with review comments within [**10**] <**Insert number**> days of receipt.

When review comments have been resolved, the CxA will provide final construction checklists marked "Approved for Use, (date)."

Use only construction checklists marked "Approved for Use, (date)" when performing tests. Mark construction checklists in the appropriate place, as indicated Project events are completed, and provide pertinent details and other information.

Retain first paragraph below if construction checklists are to be prepared by Contractor. Coordinate with "Informational Submittals" Article.

* + - * 1. Prepare preliminary detailed construction checklists for each fire-suppression system, assembly, subsystem, equipment, and component required to be commissioned, as detailed in [**NFPA 3**] [**and IgCC**] <**Insert Cx standard**>.

Submit preliminary construction checklists to CxA and Designer for review.

When review comments have been resolved, the CxA will provide final construction checklists marked "Approved for Use, (date)."

Use only construction checklists marked "Approved for Use, (date)" when performing tests. Mark construction checklists in the appropriate place, as indicated Project events are completed, and provide pertinent details and other information.

On projects subject to IgCC, the following fire-suppression systems must be commissioned as a minimum. Delete systems not applicable to Project. Add system as required for the Project. On projects not subject to IgCC, paragraphs below may be modified as required to suit Project.

* + - * 1. Systems Required to Be Commissioned under IgCC:

Water-pumping and -mixing systems over 5 hp and purification systems.

* + - * 1. Additional Systems Required to Be Commissioned:

Additional systems may be commissioned as required. Revise subparagraphs below to indicate Cx requirements on this Project.

Facility fire-suppression water-distribution piping outside the building, including the following:

Fire-suppression water piping, fittings, and specialties outside the building.

Hydrants and fire-department connections.

Fire-alarm devices.

Meters and meter pits.

Outdoor water-storage tanks.

Sleeves and sleeve seals.

Meters and gauges.

General-duty and specialty valves.

Hangers and supports.

Heat tracing.

Vibration isolation[**and seismic restraints**].

Identification.

Insulation.

Fire-suppression standpipes, including the following:

Fire-suppression water piping, fittings, and specialties inside the building.

Fire-department connections.

Fire pumps, motors, accessories, and controls.

Pressure-maintenance pumps, motors, accessories, and controls.

Sleeves and sleeve seals.

Indoor water-storage tanks.

Meters and gauges.

General-duty and specialty valves.

Hangers and supports.

Heat tracing.

Vibration isolation[**and seismic restraints**].

Identification.

Insulation.

Fire-suppression sprinkler systems, including the following:

Wet-pipe sprinkler piping, fittings, sprinklers, and specialties.

Dry-pipe sprinkler piping, fittings, sprinklers, and specialties.

Pre-action, deluge sprinkler piping, fittings, sprinklers, and specialties.

Fire pumps, motors, accessories, and controls.

Pressure-maintenance pumps, motors, accessories, and controls.

Compressed-air piping, compressors, motors, accessories, and controls.

Sleeves and sleeve seals.

Meters and gauges.

General-duty and specialty valves.

Hangers and supports.

Heat tracing.

Vibration isolation[**and seismic restraints**].

Identification.

Insulation.

Clean-agent fire-extinguishing systems, including the following:

Piping, fittings, outlets, and specialties.

Storage tanks, manifolds, mounting devices, controls, and accessories.

Sleeves and sleeve seals.

Meters and gauges.

General-duty and specialty valves.

Hangers and supports.

Vibration isolation[**and seismic restraints**].

Identification.

Insulation.

Documentation:

Fire-suppression system operating manuals.

Documentation of required Cx.

Documentation of required operator training.

<**Insert additional systems**>.

* + - 1. Cx TESTING PREPARATION
				1. Certify that fire-suppression systems, subsystems, and equipment have been installed, calibrated, and started and that they are operating in accordance with the Contract Documents and approved submittals.
				2. Certify that fire-suppression system instrumentation and control systems have been completed and calibrated, that they are operating in accordance with the Contract Documents and approved submittals, and that pretest set points have been recorded.
				3. Set systems, subsystems, and equipment into operating mode to be tested in accordance with approved test procedures (for example, normal shutdown, normal auto position, normal manual position, unoccupied cycle, emergency power, and alarm conditions).
			2. Cx TEST CONDITIONS
				1. Perform tests using design conditions, whenever possible.

Simulated conditions may, with approval of Architect, be imposed using an artificial load when it is impractical to test under design conditions. Before simulating conditions, calibrate testing instruments. Provide equipment to simulate loads. Set simulated conditions as directed by CxA, and document simulated conditions and methods of simulation. After tests, return configurations and settings to normal operating conditions.

Cx test procedures may direct that set points be altered when simulating conditions is impractical.

Cx test procedures may direct that sensor values be altered with a signal generator when design or simulating conditions and altering set points are impractical.

* + - * 1. If tests cannot be completed because of a deficiency outside the scope of the fire-suppression system, document the deficiency and report it to Architect. After deficiencies are resolved, reschedule tests.
				2. If seasonal testing is specified, complete appropriate initial performance tests and documentation, and schedule seasonal tests.
			1. Cx TESTS COMMON TO FIRE-SUPPRESSION SYSTEMS
				1. Measure capacities and effectiveness of systems, assemblies, subsystems, equipment, and components, including operational and control functions, to verify compliance with acceptance criteria.
				2. Test systems, assemblies, subsystems, equipment, and components for operating modes, interlocks, control responses, responses to abnormal or emergency conditions, and response compared to acceptance criteria.
				3. Coordinate schedule with, and perform Cx activities at the direction of, CxA.
				4. Comply with Construction Checklist requirements, including material verification, installation checks, startup, and performance test requirements specified in Division 21 Sections specifying fire-suppression systems and equipment.
				5. Provide technicians, instrumentation, tools, and equipment to perform and document the following:

Cx Construction Checklist verification tests.

Cx Construction Checklist verification test demonstrations.

* + - 1. CONSTRUCTION CHECKLIST EXAMPLES

Specific test procedures are to be developed by the CxA or Contractor. Paragraphs below represent a potential outline of procedures for certain typical systems and are provided as examples. Revise as required.

* + - * 1. Vibration Isolation in Fire-Suppression Systems:

Prerequisites: Acceptance of results of construction checklists for vibration[**and seismic**] control devices specified in [**Section 210548 "Vibration and Seismic Controls for Fire-Suppression Piping and Equipment."**] [**Section 210548.13 "Vibration Controls for Fire-Suppression Piping and Equipment."**]

Components to Be Tested:

Vibration isolation control devices in water-based fire-suppression systems.

[**Seismic control devices for proper device selection and installation.**]

Support systems.

Test Purpose: Evaluate effectiveness of vibration isolation[**and proper installation of seismic**] control devices.

Test Conditions: Measure vibration of the facility structure at [**three**] <**Insert number**> locations designated by Director’s Representative's witness while the isolated equipment operates.

Retain first three subparagraphs below if isolated equipment operates at variable speed. Delete if isolated equipment operates at constant speed.

Maximum speed.

Minimum speed.

Critical speed.

Acceptance Criteria: Structure-borne vibration not to exceed specified performance.

* + - * 1. Supervision of Fire-Protection Valves in Water-Based Fire-Suppression Systems:

Prerequisites: Acceptance of results of construction checklists for valves specified in the following Sections:

Section 210523 "General-Duty Valves for Water-Based Fire Protection Piping."

Section 211200 "Fire-Suppression Standpipes."

Section 211313 "Wet-Pipe Sprinkler Systems."

Section 211316 "Dry-Pipe Sprinkler Systems."

Equipment and Systems to Be Tested:

Supervised valves in water-based fire-suppression systems.

Division 28 fire-detection and -alarm systems.

Test Purpose: Verify generation of supervisory alarm at the fire-alarm control panel in response to activation of valve supervision device or tamper switch.

Test Conditions:

Fire-alarm system operating in normal, automatic mode.

Activate valve supervision devices and tamper switches, one at a time.

Acceptance Criteria: Activation of valve supervision device or tamper switch generates supervisory alarm at fire-alarm control panel.

* + - * 1. Heat Tracing in Water-Based Fire-Suppression Systems:

Prerequisites: Acceptance of results of construction checklists for heat tracing specified in water-based fire-suppression systems. Comply with requirements in Section 210533 "Heat Tracing for Fire-Suppression Piping."

Equipment and Systems to Be Tested:

Self-regulating, parallel-resistance heating cables.

Heater trace circuit controller.

Interface with fire-alarm control panel.

Test Purpose:

Evaluate response to ambient temperature below freeze-protection set point.

Evaluate heating cable fault alarm.

Test Conditions:

Subject temperature sensor to temperature approximately [**3 deg F**] <**Insert value**> above freeze-protection set point (initial set point [**41 deg F**] <**Insert value**>). Monitor sensed temperature with a calibration-grade thermometer. Gradually change set point or sensed temperature until freeze-protection circuit is energized.

Subject temperature sensor to temperature approximately [**3 deg F**] <**Insert value**> below freeze-protection set point (initial set point [**41 deg F**] <**Insert value**>). Monitor sensed temperature with a calibration-grade thermometer. Gradually change set point or sensed temperature until freeze-protection circuit is de-energized.

Simulate an electrical fault on the heating cable.

Acceptance Criteria:

Freeze-protection circuit is energized at set-point temperature of minus 2 deg F.

Freeze-protection circuit is de-energized at set-point temperature of plus 2 deg F.

Heater trace circuit controller initiates an alarm of cable fault. Alarm is correctly reported at the fire-alarm control panel.

* + - 1. Cx TESTS FOR DRY-PIPE SPRINKLER PIPING, FITTINGS, SPRINKLERS, AND SPECIALTIES

Retain "Air Compressor Run Time" Paragraph below for dry-type standpipes and sprinkler systems.

* + - * 1. Air Compressor Run Time:

Prerequisites: Acceptance of results of construction checklists specified in Section 211316 "Dry-Piping Sprinkler Systems."

Systems and Equipment to Be Tested:

Air compressors in fire-suppression systems.

Associated compressed air piping, valves, and appurtenances.

Associated air pressure controllers.

Test Purpose: Evaluate air compressor run time and number of compressor starts.

Test Conditions:

Keep compressed air and associated sprinkler piping openings closed during test.

For systems with multiple compressors, lock out compressor motors on all but one compressor. Repeat test for each compressor in turn.

Record number of air compressor motor starts during a 14-day period.

Record air compressor motor run time during the same 14-day period.

Acceptance Criteria:

Number of compressor motor starts during test period shall not exceed [**20**] <**Insert number**>.

Compressor motor run time during test period shall not exceed [**60 minutes**] <**Insert time**>.

* + - 1. Cx TESTS FOR CLEAN-AGENT FIRE-EXTINGUISHING SYSTEMS
				1. Carbon-Dioxide Concentration in Carbon-Dioxide Fire-Extinguishing System:

Prerequisites:

Acceptance of results of construction checklists specified in Section 212113.13 "High-Pressure, Carbon-Dioxide Fire-Extinguishing Systems."

Acceptance of results of construction checklists specified in Section 212113.16 "Low-Pressure, Carbon-Dioxide Fire-Extinguishing Systems."

Acceptance of construction checklists specified in Division 23 for systems and equipment serving the protected space.

Partitions, ceilings, doors, and other openings complete in the vicinity of the protected space.

Systems and Equipment to Be Tested:

High-pressure, carbon-dioxide fire-extinguishing systems.

Low-pressure, carbon-dioxide fire-extinguishing systems.

Protected space enclosure.

HVAC system protected space isolation equipment.

Test Purpose: Evaluate initial and final carbon-dioxide concentration in the protected space following carbon-dioxide release.

Test Conditions:

HVAC systems operating in normal, occupied, automatic control.

Fire-detection and -alarm systems operating in normal, occupied, automatic control.

Carbon-dioxide fire-extinguishing system charged and operating in normal, occupied, automatic control.

Protected space air temperature is 70 deg F.

Create a fire-alarm event in the carbon-dioxide protected space, resulting in discharge of carbon-dioxide fire-extinguishing system.

Measure and record carbon-dioxide concentration at [**four**] <**Insert number**> locations selected by the CxA when the carbon dioxide is completely dispersed and at the end of holding time.

Acceptance Criteria: Carbon-dioxide concentration is no less than [**34**] <**Insert number**> percent concentration by volume at 70 deg F.

* + - * 1. Clean-Agent Concentration in Clean-Agent Fire-Extinguishing System:

Prerequisites:

Acceptance of results of construction checklists for Section 212200 "Clean-Agent Fire-Extinguishing Systems."

Acceptance of construction checklists specified in Division 23 for systems and equipment serving the protected space.

Partitions, ceilings, doors, and other openings complete in the vicinity of the protected space.

Systems and Equipment to Be Tested:

Clean-agent fire-extinguishing systems.

HVAC system protected space isolation equipment.

Protected space enclosure.

Test Purpose: Evaluate initial and final clean-agent concentration in the protected space following carbon-dioxide release.

Test Conditions:

HVAC systems operating in normal, occupied, automatic control.

Fire-detection and -alarm systems operating in normal, occupied, automatic control.

Clean-agent fire-extinguishing system charged and operating in normal, occupied, automatic control.

Protected space air temperature is 70 deg F.

Create a fire-alarm event in the clean-agent protected space, resulting in discharge of clean-agent fire-extinguishing system.

Measure and record clean-agent concentration at [**four**] <**Insert number**> locations selected by the CxA when the clean agent is completely dispersed and at the end of holding time.

Acceptance Criteria: Clean-agent concentration is no less than [**34**] <**Insert number**> percent concentration by volume at 70 deg F.

END OF SECTION 210800